INTERNATIONAL BOTTOM TRAWL SURVEY WORKING GROUP (IBTSWG)

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Contents

i Executive summary

The International Bottom Trawl Survey Working Group (IBTSWG) coordinates fishery-independent multispecies bottom-trawl surveys within the ICES area. These long-term monitoring surveys provide data for stock assessments and facilitate examination of changes in fish distribution and abundance. The group also promotes the standardization of fishing gears and methods and survey coordination. This report summarizes the national contributions in 2020–2021 and plans for the 2021–2022 surveys coordinated by IBTSWG. In the North Sea, the surveys are performed in quarters (Q) Q1 and Q3 while in the Northeast Atlantic the surveys are conducted in Q1, Q3, and Q4 with a suite of 14 national surveys covering a large area of continental shelf that ranges from North of Scotland to the Gulf of Cádiz. Despite the COVID-measures and bad weather, most surveys were able to complete the majority of the planned hauls. The Portuguese survey (PT-GFS-Q4) was cancelled in 2020 due to issues associated with the new vessel and a COVID-outbreak. A COVID-related delay in submitting the cruise application form for the French CGFS20 survey resulted in no authorisation to trawl in UK waters and only 70% of the core stations were completed. Issues with the UK permits, were also experienced in the North Sea surveys, only being resolved at the last moment, expected to be a returning issue. Therefore, IBTSWG addressed the permit issue in further detail in order to better evaluate the impact and propose possible solutions.

All surveys, except for the Spanish GCGF-Q1 21 which is cancelled due to a vessel refit, are planned to take place according to the manuals in the next year.

The SCOROC Q3 20 survey recorded second highest recruitment of zero group haddock on the Rockall Bank since the start of the new survey series in 2011. The North Sea Q1 21 survey recorded good recruitment of haddock as well, and high recruitment of mackerel, while overall herring recruitment seemed low except for three exceptionally large catches in the Skagerrak/Kattegat bringing the index above average. Both North Sea surveys reported large amounts of target species outside their index areas, which may warrant a revision of the species-specific areas on which the standard abundance indices are calculated.

IBTSWG will continue a number of collaborative activities later this year. The Workshop on the Further Development of the New IBTS Gear (WKFDN) will focus on updating results of gear trails with the potential new gears. The Workshop on the production of swept area estimates for all hauls in DATRAS for biodiversity assessments (WKSAE) will continue work on the Northeastern Atlantic Flexfile available via DATRAS, for which country specific algorithms are used to fill data gaps relevant for the calculation of the swept area. This and the already available North Sea Flexfile can be used to produces swept area indices. IBTSWG also met with members of the assessment groups, Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) and Working Group on Elasmobranch Fishes (WGEF), to improve communication on for example circumstances affecting the execution of the surveys but also changes in survey design potentially impacting the indices.

ii Expert group information

Expert group name	International Bottom Trawl Survey (IBTSWG)
Expert group cycle	Multiannual fixed term
Year cycle started	2019
Reporting year in cycle	3/3
Chair(s)	Ralf van Hal, The Netherlands
	Pascal Laffargue, France
Meeting venue(s) and dates	1-5 April 2019, Den Helder, The Netherlands (23 participants)
	30 March- 3 April 2020, Online meeting (22 participants)
	12-16 April 2021, Online meeting (40 participants)

1 List of Outcomes and Achievements of the WG in this delivery period

- The COVID-19 measures forced the IBTSWG to be held online and by correspondence. We can be satisfied with a drastic reduction of our carbon footprint for this period, next to that it enabled (short) participation of many people relevant for specific sessions.
- Description of survey products: Survey summaries of IBTS coordinated surveys for Q1 2019 (NEA), Q3/Q4 2019 (NS/NEA) and Q1 2020 (NS);
- Successfully uploading of all the datasets according to the new Unified Datras format
- Validated NS IBTS Q3 2020 and Q1 2021 datasets (available via DATRAS);
- Validated 13 North eastern Atlantic survey 2020 datasets (available via DATRAS);
- Development of survey trawls, workshop on track to take place in the fall of 2021;
- FlexFile for the Northeastern Atlantic survey available via Datras for validation, which can be used during WKNSAE end of May 2021.
- Presentation prepared for informing WGNSSK;
- Feedback provided to the RCG Stomach process to consistently collect diet information of a large group of species caught by the IBTS-surveys.
- Feedback provided to WGEF and the plaice benchmark on the use of the IBTS data.
- Session held to inform WGNSSK and WGEF on the IBTS data.
- Letter to ICES on Permit issues.

2 Coordination of North Sea and Northeast Atlantic surveys (ToR a)

2.1 Combined North Sea and Northeast Atlantic survey effort

Plots of demersal trawling effort for all the associated surveys covered within this current reporting period in the North Sea (NS) and the north-eastern Atlantic (NEA) areas are provided below in figure 2.1.1. Distribution plots for selected species encountered during the IBTS surveys (NS and NEA) in summer and autumn (Q3/4) are presented in Annex 6. The species are listed below in table 2.1.1. For certain target species these have been separated into pre and post recruits and details of the length split for these species are also provided in the table.

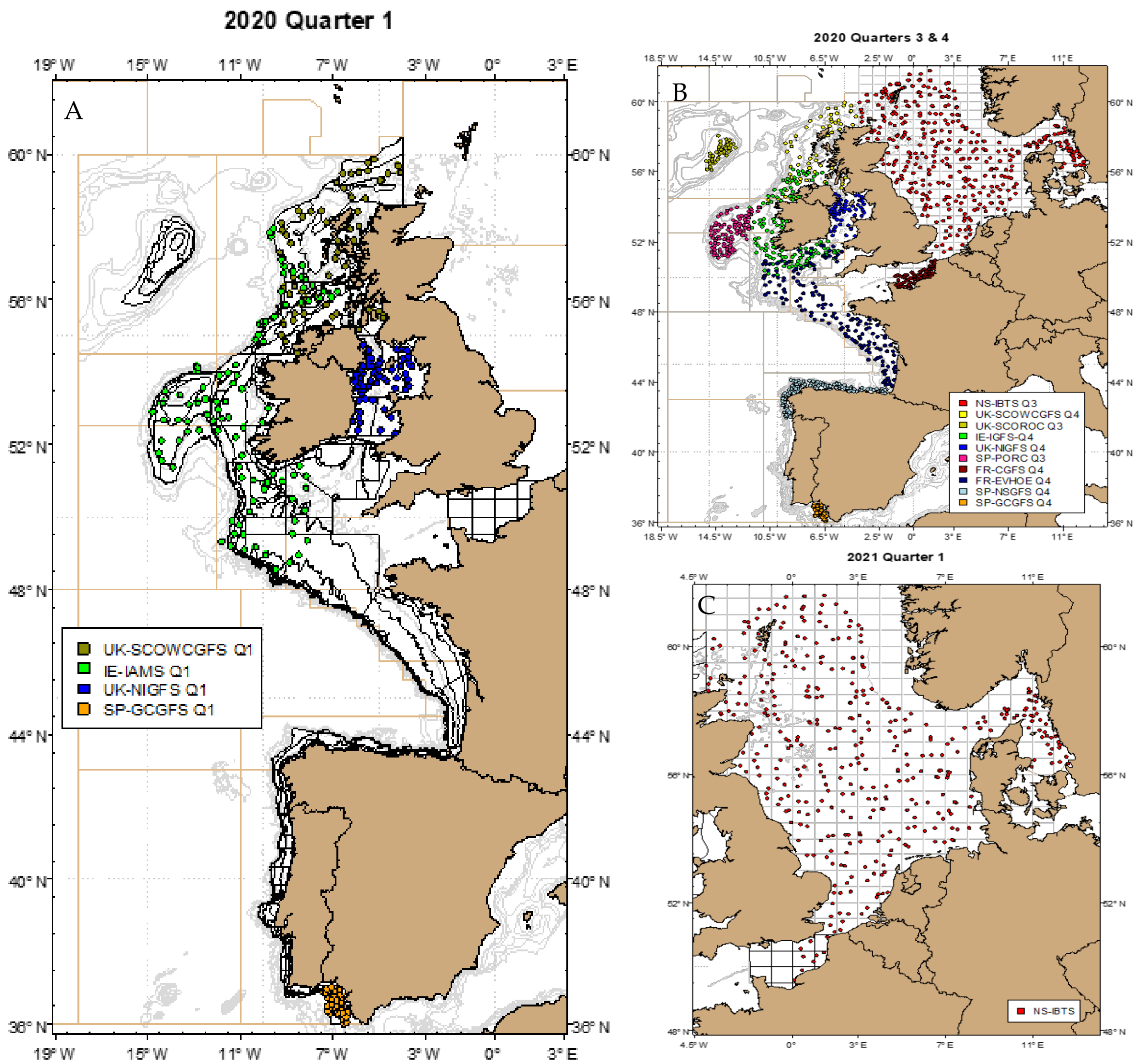

Figure 2.1.1. Station positions for the IBTS carried out during A) Q1 2020 in the north-eastern Atlantic, B) in the north-eastern Atlantic and North Sea area in Q3/Q4 of 2020, C) Q1 2021 in the North Sea area.

Table 2.1.1. Species for which distribution maps have been produced (Annex 6), with length split for pre-recruit (0-group) and post-recruit (1+ group) where appropriate. The maps cover all the areas encompassed by surveys coordinated within the IBTSWG (North Sea and North-eastern Atlantic Areas).

Scientific	Common	Code	Fig No (Annex 6)	Length Split (<cm)
Capros aper	Boarfish	BOC	44	
Clupea harengus	Herring	HER	6-7	17.5
Conger conger	Conger	COE	45	
Gadus morhua	Atlantic Cod	COD	2-3	23
Galeorhinus galeus	Tope Shark	GAG	33	
Galeus melastomus	Blackmouthed dogfish	DBM	31	
Lepidorhombus boscii	Four-Spotted Megrim	LBI	16-17	19
Lepidorhombus whiffiagonis	Megrim	MEG	14-15	21
Leucoraja naevus	Cuckoo Ray	CUR	35	
Lophius budegassa	Black-bellied Anglerfish	WAF	20-21	20
Lophius piscatorius	Anglerfish (Monk)	MON	18-19	20
Merlangus merlangius	Whiting	WHG	24-25	20
Melanogrammus aeglefinus	Haddock	HAD	4-5	20
Merluccius merluccius	European hake	HKE	8-9	20
Micromesistius poutassou	Blue whiting	WHB	26-27	19
Mustelus spp.	Smooth Hound	SMH	34	
Nephrops norvegicus	Norway Lobster	NEP	28	
Pleuronectes platessa	European Plaice	PLE	22-23	12
Raja brachyura	Broadnose skate	RJH	40	
Raja clavata	Thornback ray (Roker)	THR	36	
Raja microocellata	Painted/Small Eyed Ray	PTR	37	
Raja montagui	Spotted Ray	SDR	38	
Raja undulata	Undulate Ray	UNR	39	
Scomber scombrus	European Mackerel	MAC	12-13	24
Scyliorhinus canicula	Lesser Spotted Dogfish	LSD	29	
Scyliorhnus stellaris	Nurse Hound	DGN	30	

Sprattus sprattus	European sprat	SPR	41	
Squalus acanthias	Spurdog	DGS	32	
Trachurus picturatus	Blue Jack Mackerel	JAA	43	
Trachurus trachurus	Horse Mackerel (Scad)	HOM	10-11	15
Trisopterus smarkii	Norway pout	NPO	42	
Zeus faber	John Dory	JOD	46	

2.2 North Sea Q1

(Coordinator: Ralf van Hal)

2.2.1 General Overview

The North Sea IBTS Q1 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES Division 3.a, Subarea 4 and part of Division 7.d. During daytime a bottom trawl, the GOV (Grand Ouverture Verticale), with groundgear A or B, was used. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. During night-time herring larvae were sampled with a MIK-net (midwater ring net). Age data were collected for the target species cod, haddock, whiting, saithe, Norway pout, herring, mackerel, and sprat, and several additional species.

The quarter 1 2021 fleet consisted of seven vessels: “Dana” (26D4, Denmark), “GO Sars” (58G2, Norway), “Scotia” (748S, Scotland), “Thalassa” (35HT, France), “Walther Herwig III” (06NI, Germany), “Tridens II” (64T2, Netherlands) and “Svea” (77SE, Sweden). The survey covered the period 19 January to 24 February 2021. A total of 384 GOV hauls (10 of which were invalid) were uploaded to DATRAS and 683 valid MIK hauls were deployed. All ICES Rectangles were covered by at least one GOV haul and at least two MIK hauls. The extensive summary report can be found in Annex 3.

2.2.2 Highlights

- Catches of haddock and whiting, specifically two-year-olds were large. The preliminary indices indicate that also the age-1 haddock was large, but not as large as in 2020.
- The preliminary indices of age-1 mackerel are very high compared to the average and compared to the catches in latest years.
- The NS-herring index was low, however owing to a small number of large catches in the Skagerrak/Kattegat (3 in Kattegat, 1 in Skagerrak) the combined index of the two areas is above the long-term average.
- COVID-19 regulations changed some of the surveys a bit, especially weekend breaks in foreign harbours were not allowed as a result no breaks or very short breaks were held.
- UK-permit issues persisted. Except for Scotland being allowed to fish in their own waters, all other countries requiring a UK-permit received this only on the very latest moment. For France this they had been waiting in the North Sea to receive the permit and they were already heading back to Boulogne when they received it. They returned to the North Sea but were unable to cover their most northern stations in UK-waters. As this was anticipated, while waiting for the

permit they had covered some Dutch stations outside UK-waters, enabling the Dutch to spend additional time in UK-waters to cover the French stations.

- Denmark did not receive dispensation for bottom trawling in UK Marine Protected Areas, therefore rectangles 38F1 and 38F2 were not fished by them.
- Germany has reported recordings of very large net-opening and investigated this issue further as their net-opening has been very variable over the years.
- Additional data on haddock was collected: length/weight, presence of dwarf growth and the presence of the parasite *Lernaeocera branchialis*.
- Atlantic saury (*Scomberesox saurus*) was caught by the French in German waters (37F6).

2.2.3 Planning and Coordination

For 2022, all participants indicate to be part of the survey again and as the situation currently is they all plan to use their own national vessel. The start dates of the national surveys is therefore likely to be very similar as in Q1 2021. The Swedish survey, now familiar with the new vessel, will be back to the original duration of 14 days.

It is decided to keep the spatial allocation of the tows similar as in Q1 2021. The only change is that Sweden must reduce the number of hauls in the North Sea, due to the duration of their cruise. Therefore, the Swedish haul in rectangle 44F5 will be covered by Denmark. In return Sweden will again be covering 44G0 instead of Denmark (figure 2.2.3.1). Sweden will, when time allows, again try to cover an additional rectangle "43F9" to increase overlap with Denmark in an area where small plaice is caught. Norway will continue the haul in 44F6. Next to that, a priority, when there is additional time, is placed for countries fishing near the Norwegian Trench on doing additional tows at the edge of the Norwegian trench at depths down to 300 m.

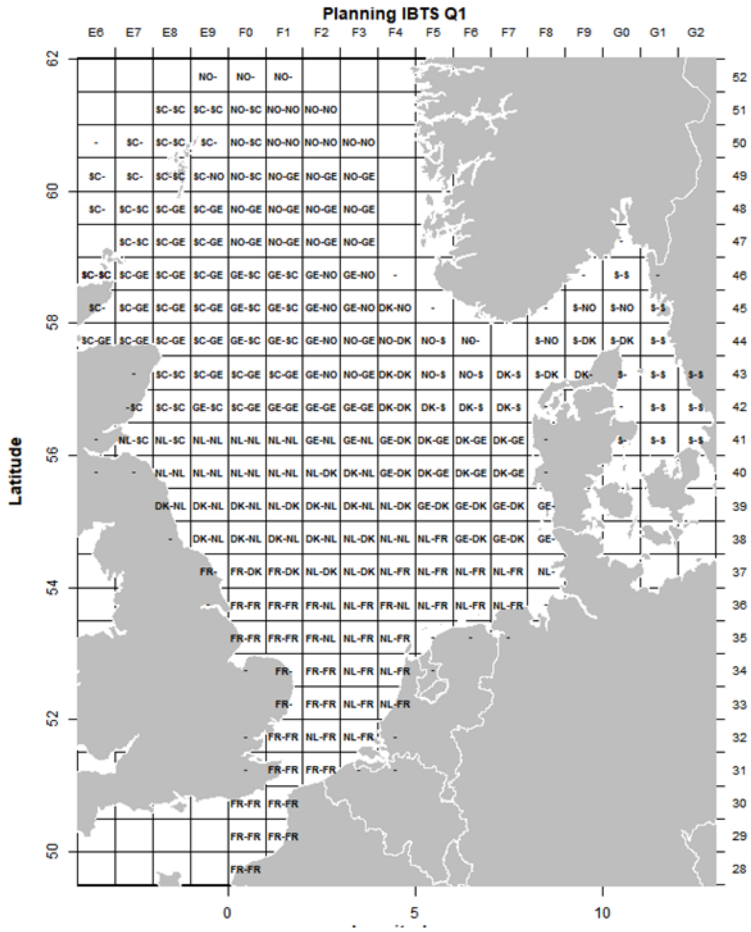

Figure 2.2.3.1. **Allocation map for Q1 2021.**

Additional sampling on parasites

- Denmark has observed infestation of North Sea cod with liver worms for the first time in Q1 2021. Infestations were quite comparable to Baltic cod. It is recommended that the NS-IBTS participants record infestation of cod with liver worms in future surveys in order to monitor timely a possible increase in the infestation rates and describe the spatial gradient from the Kattegat and Skagerrak area into the North Sea. Guidelines will be provided by the Q3 coordinator together with the international program for the Q3 2021 survey.
- Sampling on haddock condition and infestation with gill parasites shall continue in the Q1 NS-IBTS. When possible, also record these same parasites for whiting, Norway pout and potentially other species like bib and poor cod.

2.2.4 Species level identification

Not in all cases it possible to identify species to species level. Looking at the available names in the current upload it seems that different choices are made in those cases. This results in different CPUE

Datras products while it seems the same species/species group is meant. A number of these cases was further discussed and clarified why specific choices are made.

- *Mustelus, Mustelus mustelus, Mustelus asterias*. There are guides identifying the two *Mustelus* species based on visual characteristics. However, DNA analysis indicate that most likely only one species, *Mustelus asterias*, occurs in the North Sea and eastern Atlantic and that visual characteristics are not suitable to detect differences. Identifying all *Mustelus* using DNA is currently still impossible, leaving the possibility that some of them might be *Mustelus mustelus*. Therefore, it is proposed to report all the Mustelus as Mustelus sp., unless DNA confirmation is available. In that case, this should be reported as well. Preferably, this is corrected back in time.
- *Loliginidae, Loligo, Loligo forbesii* (Currently, *L. forbesi* is present, however that is an erroneous linkage of Aphia_code and species names, see paragraph 3.10), L. vulgaris. If possible all countries try to report these to species level, however when parts are missing of these relatively fragile species visual identification is no longer possible. In those cases, *Loligo* is reported. The countries reporting *Loliginidae* do that in the case they are unable to sort the whole catch of small squid completely or in case the small individuals are too damaged to identify. Then *Loligo* species, *Illex* species and *Alloteuthis* species could be part of this sample. It is preferred to do this only in the most difficult cases and to bring these species to species level when possible.
- *Illex* and *Illex coindetii*: Most likely only *Illex coindetii* occurs in our survey area. However, there is a possibility that *Illex illecebrosus*, like *I. coindetii* (Oesterwind et al. 2020), would migrate into the North Sea. It is unlikely, that currently the distinction between these two species, especially of the small individuals is made. However, Oesterwind et al. (2020) report *I. illecebrosus* is absent from the area, and is recorded only because in the past *I. coindetii* was thought to be a subspecies of *I. illecebrosus* (Nesis, 1987), i.e. *I. illecebrosus coindetii* (e.g. Grimpe, 1925). Thus, it is preferred to upload all *Illex* as *Illex coindettii*, however make sure to keep on identifying the species to make it possible to identify *I. illecebrosus* if it occurs.
- *Alloteuthis* and *Alloteuthis subulata*. *Allotheuthis* is reported as a precautionary approach as there is some uncertainty if *Alloteuthis media* occurs in the North Sea. There are historic recordings of this species and owing to the similarities with *A. subulata* it is unlikely that this species will be separated on board. Typically, *A. media* has been considered to be the Mediterranean species, while *A. subulata* occurs in both the Mediterranean and the North Sea (Lefkaditou et al. 2012, Gebhardt and Knebelsberger 2015, OBIS, www.iobis.org). However, the differentiation between the two species remains difficult and the taxonomy is obscure (see discussion in Gebhardt and Knebelsberger 2015). Vecchione & Young (2010) stated that genetic analyses indicated that *A. media* and A. subulata may represent extremes of a morphological gradient in a single species. They considered *A. media* to be "very rare in the North Sea". Nevertheless, in the FAO guide Jereb et al. (2010) – referring also to Anderson et al. (2008) - stated "Clearly, further studies are required to help define the whole species complex. Until the taxonomic situation with *A. media* and *A. subulata* is resolved, we retain them here as separate entities". Yet, there are some arguments to unify the naming within the IBTS/DATRAS into *A. subulata*:

(1) the general/predominant assumption that *A. subulata* is "the North Sea species".

(2) Germany routinely performed quality checks of cephalopod of IBTS Q1 and Q3 samples by verification through a cephalopod expert. He has never been able to identify *A. media*, but only *A. subulata* (per. comm. Daniel Oesterwind, Thünen Institute of Baltic Sea Fisheries).

However, because some experts did identify *A. media* in the North Sea, the issue needs clarification. For many squid species it could be useful to conduct a genetic study to see which species are actually occurring in the area, particularly for *Alloteuthis subulata* vs. *A. media*, and e.g. for the family Sepiolidae.

2.2.5 References

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2.3 North Sea Q3

(Coordinator: Kai Wieland)

2.3.1 General Overview

The North Sea IBTS Q3 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES Division 3a and Subarea 4. The bottom trawl, GOV (Grand Ouverture Verticale) with standard ground gear A for normal bottom conditions or ground gear B for rough ground (Scotland in area 4a only) is used during daytime. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. Age and individual fish data were collected for the standard species herring, sprat, cod, haddock, whiting, saithe, Norway pout, mackerel and plaice, and for a number of additional species.

Six nations participated in the quarter 3 survey in 2020. The overall survey period extended from 17 July to 4 September. In this period 355 valid GOV hauls were conducted. All rectangles allocated to the survey area were covered by at least one GOV haul. The total number of tows was the highest while average tow duration decreased slightly in the past three years (Fig. 2.3.1.1). A detailed report for the survey in 3Q2020 is be found in Annex 4.

2.3.2 Highlights

- Only few rectangles did not achieve full coverage with two hauls, and the number of rectangles covered by only one haul was less than in the past ten years. Of the rectangles with only one haul, most are rectangles that are largely covered by land or other obstructions, or are not fishable with the GOV;
- 45 tows reported as valid to DATRAS were shorter than 27 minutes and for 9 of these tows' duration was just 15 minutes. Limited space due to safety distance rules from an increasing

number of e.g., cables and pipelines and rough bottom conditions on alternative tracks have been the main reason for this;

- Compared to the other countries, Germany reports relative high values for vertical net opening for 2020/2021, for which the reason could not yet be identified. In contrast, Norway reported values below or close to the lower theoretical limits despite the fact that Norway has returned to the original mounting of the floats directly on the headline instead of using a top rope. Considering the differences between countries and changes over time it appears advisable that a vessel/country effect is included in modelling abundance indices for pelagic species, i.e., mackerel;
- As in previous years, high densities of some target species were found outside the actual index areas, e.g., cod, Norway pout and mackerel. Saithe and plaice index areas were revised during recent benchmarks. For the other species, actual distribution patterns may warrant a revision of the species-specific areas on which the standard abundance indices are calculated in DATRAS.

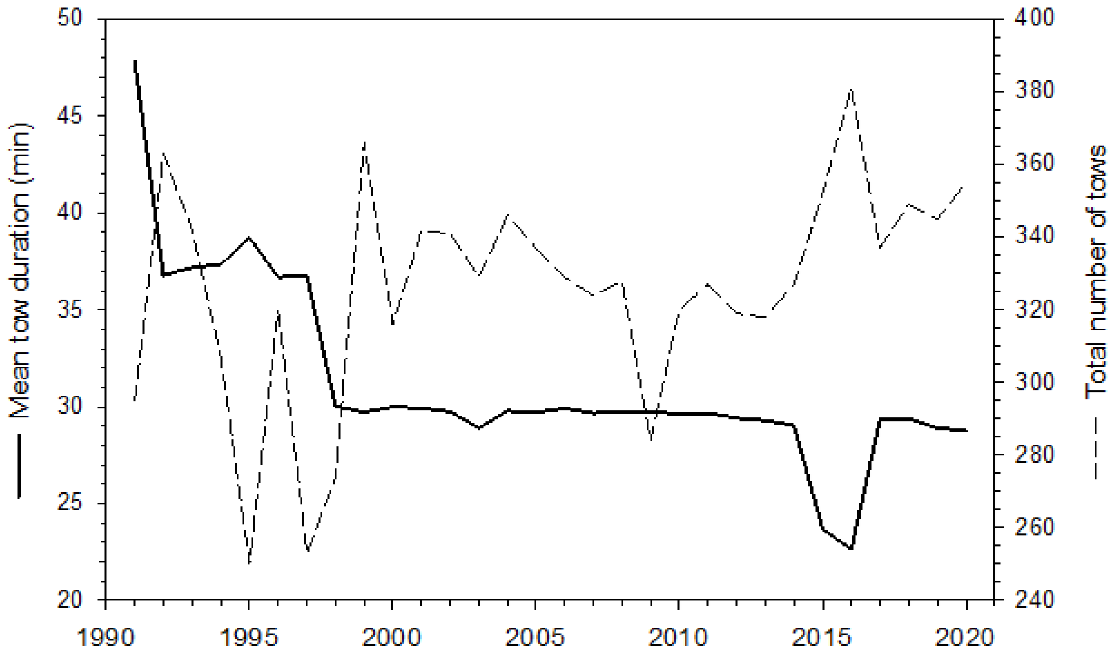


Figure 2.3.1.1. Mean tow duration and total number of valid tows in the 3rd quarter NS-IBTS (1991-1997: standard tow duration of 30 min adopted by all countries first in 1998; 2009: no participation of Norway, 2015-2016: 50 % of the tows in area 4 planned as 15 min tows).

2.3.3 Planning and Coordination

All regularly contributing countries intend to participate in the quarter 3 2021 NS-IBTS survey program. Below is a table showing the expected program dates for each country for this year.

Denmark	Dana	17 August to 3 September
England	Cefas Endeavour	17 July to 16 August

Germany	Walther Herwig III	19 July to 17 August
Norway	Kristine Bonnevie	12 July to 15 August
Scotland	Scotia	28 July to 17 August
Sweden	Svea	23 August to 4 September

The actual rectangle allocation to the countries is show in Figure 2.3.3.1. Country specific maps (and allocation to rectangle base file) as well as information on additional sampling requests (e.g., experimental tows in 200 – 300 m depth, infestation of cod with liver worm (*Contracaecum osculatum*), deadline(s) for data submission to DATRAS which preliminary is set 15 October 2021) will be provided to the participants in the international cruise program by the coordinator at latest in early June.

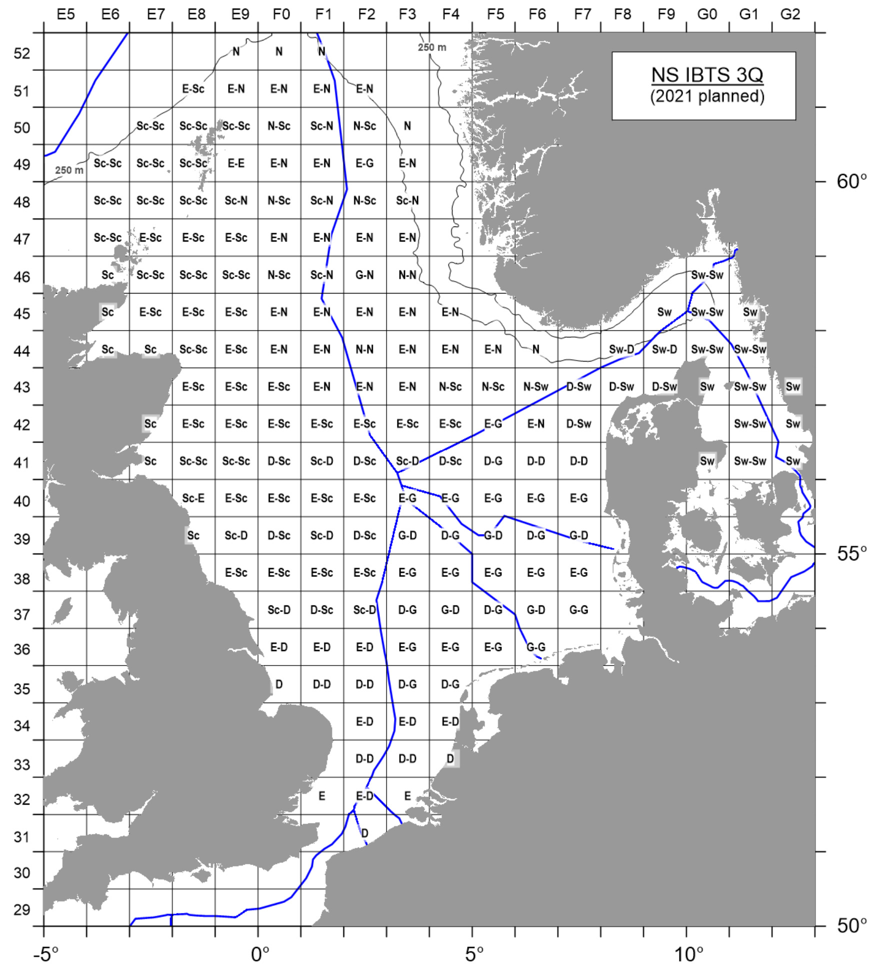


Figure 2.3.3.1. Rectangle allocation by country for the North Sea IBTS in 3Q 2021 (D: Denmark, E: England, G: Germany, N: Norway, Sc: Scotland, Sw: Sweden; EEZ limits indicated by blue lines).

2.4 Northeast Atlantic

(Coordinator: Finlay Burns)

2.4.1 General Overview

In 2020, six vessels from 5 nations performed 13 surveys along the North-eastern Atlantic (NEA) IBTS area. A total of 973 valid hauls, out of the 1174 planned hauls, were accomplished over 335 survey days distributed between all quarters of 2020 (see table A.5.1.1). Despite the significant issues that the COVID pandemic placed on all institutes during 2020, all surveys except for the Portuguese quarter 4 survey (PT-PGFS-Q4) were undertaken and with the majority being completed without significant issue. In several instances, additional objectives were added to the surveys task list to help mitigate the impact felt by the loss of earlier surveys whilst countries were in lockdown due to COVID-19, but these did not appear to have had any significant impact on progress nor their ability to fulfil core objectives.

Four quarter 1 surveys (Scotland, Northern Ireland, Ireland, and the Spanish survey in the Gulf of Cádiz) were undertaken in February and March, with the Irish anglerfish survey once again extending into April. Scotland and Spain were also active during quarter 3 within the regions of Rockall, Porcupine Bank and the Northern Spanish Coast, with France, Northern Ireland, Ireland, Scotland and Spain all active during quarter 4. Survey programme highlights as well as the realized and provisional survey dates are contained within the following sections however a more comprehensive summary of survey activities together with the individual survey reports are located within Annex 5.

2.4.2 Highlights

- The Portuguese survey (PT-GFS-Q4) was cancelled in 2020 due to issues associated with legal/logistic constraints of the new vessel, a COVID outbreak that occurred onboard during the time of the survey and bad weather. Some limited trawling was undertaken during 3 operational days with 6% of the planned survey hauls completed during this time.
- Due to the COVID-19 pandemic and the lockdown in place in France at that time there was a delay in submitting the cruise application form for the CGFS2020 to the French Foreign Ministry. The net result was that no authorisation was provided to allow the survey to trawl within UK waters and only 70% of the core survey stations were completed.
- The FR-EVHOE-Q4 survey carried out a few comparative trawls on identical tows to those undertaken by the Celtic Explorer and within the Celtic Sea. This was to compare the catches of the "classic" GOV operated by the Thalassa with the new trawl currently being tested on board the Celtic Explorer. A 7 m basking shark was reported from one of the hauls during the survey and was returned to the sea very much alive. Additional pelagic sampling as well as acoustic observations were undertaken to compensate for the loss of the spring PELGAS survey on account of COVID-19.
- COVID restrictions in place during the IE-IAMS resulted in the operational working window during that survey being reduced from 24 down to 12 hours with staffing levels and survey targets being reduced accordingly. 7 days were lost due to weather during the earlier part of the survey. Despite these issues the survey successfully completed almost 90% of the survey trawl stations. Similar to 2019, additional provision was added to undertake several additional deepwater trawl transects during the survey.
- The IE-IGFS-Q4 sustained significant disruption due to severe weather encountered mostly during the first leg of the survey. In total 9.5 days were lost and with weather being generally very poor within this period progress was slow and curtailed the distance offshore that could be surveyed. Thankfully, improved weather during later survey legs allowed better progress to be made with most stations being completed successfully. Four additional tows were undertaken successfully in order to test the performance of the new survey trawl before meeting up with the Thalassa later in the survey to conduct limited parallel fishing operations.

- SCOWCGFS Q1 survey experienced 3 named storms during the first quarter in 2020. The severe weather was compounded with multifarious vessel issues which further narrowed the operational window available to Scotia and resulted in additional days being spent in port to effect repairs for one of those issues. Improved weather conditions experienced during part 2 of the survey allowed the majority of the trawl stations to be successfully completed within the survey window. The appearance of 2 male orca while trawling West of Barra Head provided an interesting distraction during the second half.
- SCOROC survey in the 3rd quarter recorded second highest recruitment of zero group haddock on the Rockall Bank since the start of the new survey series in 2011.
- SCOWCGFS in the fourth quarter lost approximately two days to weather as well as the loss of a further day to safely remove a WW2 Geomagnetic mine from Scotia's trawl deck. This had been dragged up during routine trawling operations in the Firth of Clyde. Happily, the Royal Navy was able to neutralise it once it had been carefully removed off Scotia's trawl deck.
- UK-NIGFS-Q4 was extended by five days to undertake additional pelagic trawl stations. This was to compensate for the cancellation of an earlier pelagic commercial survey due to COVID.
- During the SP-PORC-Q3 survey, 7 additional deep tows (> 800 m) were carried out on the eastern slope margin of the survey area.

2.4.3 Planning and Coordination

Table 2.4.3.1 below, presents the expected dates for the Northeastern Atlantic IBTS surveys taking place in 2021. The Spanish GCGFS-Q1 2021 had to be cancelled.

Table 2.4.3.1. Provisional/realised dates for 2021 NeAtl Surveys.

Survey	Code	Starting	Ending	Expected hauls
UK-Scotland West (spring)	UK-SCOWCGFS -Q1	16/02/2021	11/03/2021	62
UK-Scotland Rockall	UK-SCOROC-Q3	08/09/2021	20/09/2021	40
UK-Scotland West (aut.)	UK –SCOWCGFS-Q4	14/11/2021	06/12/2021	62
UK-North Ireland (spring)	UK-NIGFS Q1	04/03/2021	19/03/2021	60
UK-North Ireland (aut.)	UK-NIGFS Q4	03/10/2021	25/10/2021	60
Ireland – Anglerfish Survey 7bcjk	IAMS-Q1	08/02/2021	04/03/2021	65
Ireland - Anglerfish Survey 6a	IAMS-Q2	10/04/2021	21/04/2021	40
Ireland - Groundfish Survey	IE-IGFS-Q4	29/10/2021	10/12/2021	170
France – EVHOE	FR-EVHOE-Q4	23/10/2021	14/12/2021	155
France - Eastern Channel	FR-CGFS-Q4	02/10/2021	17/10/2021	74
Spain – Porcupine	SP-PORC-Q3	02/09/2021	07/10/2021	80
Spain - North Coast	SP-NSGFS-Q4	17/09/2021	22/10/2021	116
Spain - Gulf of Cádiz (spring)	SP-GCGFS-Q1 *	-	-	-
Spain - Gulf of Cádiz (aut.)	SP-GCGFS-Q4	27/10/2021	11/11/2021	45
Portugal (aut.)	PT-PGFS-Q4	01/10/2021	01/11/2021	96

* *The SP – GCGFS-Q1 in 2021 has been cancelled due to scheduling issues relating to vessel being delayed in refit.*

3 DATRAS and related topics on data quality (ToR b)

3.1 Unified format submission status

Reporting show most of the newly implemented fields of the unified format are not used in HH, but most are used in HL and CA, though some countries reported these new fields more often than others. Datacentre explained that a lot of these fields such as PelSampType, DevStage, LenMeasType, FishID, AgeSource, AgePrepMet, and OtGrading are used for assessment purposes and encouraged submission of such data to DATRAS in the future.

There was a discussion in the group whether more of these fields needs to be compulsory, and if some of the fields of observational data need to be included into the survey protocol.

There was discussion around FishID, why this was not a mandatory field, since this is a primary key for all the individual fish data reported from the other fields and important for data mapping. The conclusion from this discussion was that it is possible to make more fields mandatory, but this is something the group must agree upon. There was some hesitation by the group having too many mandatory fields, and therefore it is important that the WG reviews the mandatory/optional fields as they are now and discuss if changes should be made to the DATRAS data submission. In the year 2021 IBTS countries going to review their national lab data and come with a proposal on which fields need to be part of mandatory fields.

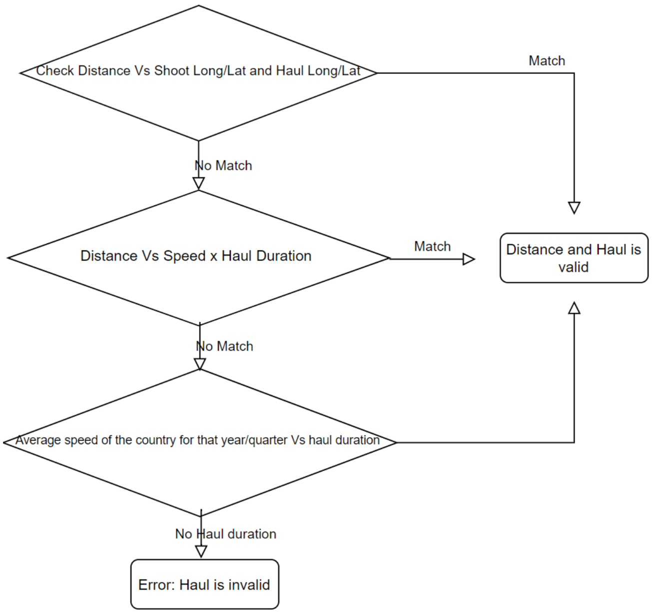
Additionally, a wish was made by the group for additional explanation regarding these new fields in HH, HL and CA with linkages to the ICES Vocabulary, where this is possible.

From this discussion, a request was made by the ICES datacentre, to have everyone who is collecting and submitting data to DATRAS, to go through a list of new fields and report on whether they will submit data to these new fields in the future and also whether more (or less) fields should be mandatory. These lists are available on the IBTSWG SharePoint site, under working documents, or here.

3.2 Distance check

Distance is one of the important fields in the Flexfile and for the swept area base products, therefor missing distance in the data submission need to be calculate base on the another HH parameter such as latitude and longitude and speed. There is a field called calculated distance in the flex file which indicates, if there is observed or calculated distance. Currently there is a check in the DATRAS screening programme to find distance is correctly reported. This check raises the warning based on Shoot latitude and longitude Vs distance, but this distance check needs to further strengthen with some additional logic which described in the flow chart.

Since there are large differences in the calculated vs. reported distance for some of the hauls in IBTS, it has been suggested to use a check in DATRAS based on trawl speed (range of 3.5 to 4.5 knots) and haul duration to calculate the distance. In this way we eliminate this distance discrepancies, since not all hauls run in a straight line from point a to point b. This is especially important for the swept area indices calculated in DATRAS. If speed is not recorded than the following flow diagram steps will check for the data.



This new check was received positively by the whole group. A suggestion by the group is to use a speed range, instead of a set speed, to calculate distance. A flag with explanation on this error/warning about distance was also wished for. The WG has to decide whether they want an error, not a warning (as it is now), or if they will want a check box (accepted warnings) for the warning to make sure the data submitter check it and are ok with it before submitting.

3.3 Swept area calculation

The FlexFiles for the NE-Atlantic surveys are ready for check by the group from the DATRAS download page. The formulas for the calculations in the FlexFile can be found on the IBTSWG SharePoint site, under working documents, or here.

Action is needed by the WG, where they need to download data from DATRAS and compare the data calculated correctly based on the revised SISP NE-Atlantic IBTS document. The review document can be found on the IBTSWG SharePoint site, under working documents, or here. Currently all years have been calculated, but the WG need to check the year base conditions.

For the surveys that do not have a formula for wingspread, there needs to be a revision of the data to come up with the formula. This will be one of the useful data products for ICES planed swept area base WK 2021.

Swept area calculation issue with Norwegian data addressed in the meeting and the Norwegian submitter going to check the formula and the missing data for door and wing spread with the final document, which will be applied to the DATRAS flex file data product.

The calculation review is crucial for the upcoming ICES Workshop on swept area indices. This workshop has the goal to produce swept area outputs from DATRAS, it is as of now scheduled from 31 May-4 June 2021, and chaired by Kai Wieland. OSPAR members going to participate, but also participation from the IBTSWG is wished for.

3.4 DATRAS dataflow

The DATRAS dataflow chart was presented shortly, and the participants were encouraged to find the document on the IBTSWG SharePoint site, under working documents (or here), and DATRAS team asked to WG members for comments and inputs to be communicated to the DATRAS administration email.

3.5 Additional indices (ALK borrowing): Whiting North and South Indices and Witch indices requirement by WGNSSK

An ad-hoc request was made from WGNSSK to DATRAS for providing two separate indices for whiting, North and South. DATRAS has been submitting such indices for the last 3 years as pilot indices. The background document for this request can be found on the IBTSWG SharePoint site, under working documents, or downloaded from here. Feedback on what to do regarding this request is needed by the IBTSWG.

The issue is, that WGNSSK wants to have the indices calculated manually and automatically with the borrow area procedure. And now they want to split the indices into two areas.
The WG commented, that the way otoliths are being collected now, not by area but by haul, the way forward is not by borrow area. Also, remarks were made upon how this splitting of the area into North and South will actually work and what the background for the split is, population (biological) or management (assessment) based. There is not a broad consensus for this approach in the WG.
The conclusion so far is that ICES datacentre will return with an answer from the WGNSSK chair regarding this issue.

DATRAS team presented the issue regarding Witch flounder data, a request made by the WGNSSK, this indices request comes to the DATRAS team as ad-hoc request. DATRAS has supplied this data since 2019, but it has not been reviewed by any experts, who can verify, and cross examine the data.
This issue was discussed during the IBTS meeting, and the conclusion was that such requests, first needs to be address to IBTSWG, as the biological sampling experts. Secondly, procedure steps need to be discussed within the group, for example borrowing ALK and aggregation based on round fish area.
The DATRAS team has communicated with WGNSSK, that they should NOT use any of the calculated data/methods, which have not been verified. IBTSWG and WGNSSK have not reviewed what area and age calculation methods should be used for nonstandard species.

A better link is required between EG and WG, so such request can be discussed internally first and the datacentre will step in at a later stage. Once results and methods has been reviewed and all checking has been completed by both groups, the new DATRAS indices will be formally accepted by NSSK and IBTSWG as a part of DATRAS standard product.

3.6 Pseudo Category

In 3Q 2020, a Scottish submitter reported an issue to the DATRAS governance group, regarding how they are not able to report data, which have a subcategory within a category. Because DATRAS allows same sub factor in the category, there is no possibility to submit subcategory-based sampling strategy as of now. Therefore, to be able to submit such data, a change in DATRAS must be made by changing some of the constraints on CatIdentifier. The background document for this request can be found on the IBTSWG SharePoint site, under working documents, or downloaded from here.
The topic was discussed by the WG, and although Scotland is the only one who needs this addition now, the new data type will be introduced in the HH data 'P' which allows pseudo category, such implementing will be done in 2021 before Q3 data submission.

What will be new changes in DATRAS?

- Proposal to create a new Datatype 'P' *(pseudocategory sampling)* on the HH record.
- Changes to HL record to accommodate sub/pseudocategory sampled data:
  - If there is no sub/ pseudocategory sampling present then Cat Identifier field value will be 11,21,31,41 (therefore all species submitted under datatype P will be categorised using this format)
  - Sub or pseudocategories will be classified as 11,12,13…
  - Subfactor values are different between each subcategory
  - CatCatchweight values will be the same between subcategory
  - Length classes are unique between each subcategory

These changes to the HL record allowing the creation of datatype P will require a relaxation of the current rule whereby Subfactor, CatIdentifier and CatCatchWeight are required to be consistent across records, however because the change is being implemented on the HH record and under the new datatype 'P' the product calculation process for other data types will not be affected. An example of a species sample using the pseudocategory method is provided below together with a flow diagram illustrating the sampling method as well as the steps taken to complete the process and finally how this data would be formatted on a DATRAS HL record under datatype 'P'.

3.7 Shiny App

On hold until September 2021 – Several WGs are asking for shiny apps and hosting from ICES. Thus, there was extensive discussion on how to organize this, to avoid duplications and optimize efforts.

Data visualisation tasks and data warehouse tasks are needed to create collate maps and data summaries widely used in the IBTSWG reports. But also, for web-based viewing to expand visualization. The priority of which data needs presentation has been done last year by the IBTSWG, at least regarding graphs. For the dynamic maps, the suggestion is to look at the maps used in the 2020 report, paragraph 2.1, other ideas are also welcome. An additional wish for the DATRAS team is for some idea collection contribution from the Survey WG which will be communicate with DATRAS administration email.

3.8 GitHub Training

ICES Datacentre has again offered to host a joint GitHub training in 2021 together with members of WGBEAM and WGBIFS.

This will include the basic use of GitHub as collaborative coding tool and for projects use if needed. It is a very good way of sharing information, discussing issues on one platform.

If people are interested, they can contact to DATRAS administration email.

3.9 DATRAS Data Acknowledgment

Erroneous data acknowledgment of Datras downloaded products has been detected, with lack of correct reference to data collector and/or submitters, which goes against ICES Data policy. All data are financed, and intentional or non-intentional lack of acknowledgment should not be permitted.

To minimize this IBTSWG suggests that the disclaimer distributed with downloaded data should include the following:

1. 4. TERMS OF USE:

Data users must communicate with the data provider prior to publication. Note: as stated in ICES Data policy, this could include the submitter contact as stated in DATRAS as it is always updated, and submitter will forward contact to his data or project manager.

2. 5. DATA ACKNOWLEDGMENT:

- The minimum requirement citation should be changed to include the Database and Working Group coordinating the data:

"ICES COUNTRY-IBTS (Country International Bottom Trawl Survey- WG) dataset (DATRAS). ICES, Copenhagen"

- Should also include WG reference and relevant SISP reference

Source: COUNTRY -IBTS (COUNTRY International Bottom Trawl Survey - WG) as described in SISP reference

- SISP should include for each country/survey a recommended acknowledgment citation in case funding should be referenced.

The working group noted that as many end-users will download the data using the R-package “icesDatras” this data acknowledgement request also needs to be positioned so that it can be seen by R-users. It is suggested that this can be achieved by adding this data acknowledgement request to the Datras website front page, or when following the link ‘R-package to access Datras’ from that page. Furthermore, the data acknowledgement request could be added to the citation information accessed within the R-package using the citation() function as this is the usual way that R-users access citation information prior to publication.

3.10 Other issues and action points

1. There was an issue with species names in DATRAS, for example, the same species was reported either with old or misspelled naming. This issue has been resolved and checks will be made to the data. WG participant that have encountered datasets with different naming for the same species are encouraged to tell the DATRAS team about this.
2.
3. New sampling scheme for otoliths and ALK. Otoliths are now collected by haul, whereas ALK now is calculated by borrow area. This procedure will need to change, so that ALK can be calculated using the new sampling procedure. Otherwise, this will produce two different ALK. There will have to be a Benchmark Group decision on how to calculate the ALK with this new method of sampling/aggregation of samples.

4. IBTSWG members’ countries will check with their national lab data and come with a proposal on which fields need to be part of mandatory fields in the unified format.

4 New survey trawl gear (ToR c)

4.1 Scottish gear development trials assessing sweep length

Further gear geometry and limited catch comparison trials were carried out using the demersal trawl (designated BT237) used by Marine Scotland on the annual herring survey. The BT237 is being used as a test platform to understand how a modern design of demersal trawl package compares against the GOV trawl used for Scottish IBTS surveys. The trials were undertaken over 12 days, between the 25th October and 5th November, and looked to build on data/information obtained during the 2018 and 2019 trials (IBTSWG Reports 2018 and 2019). The main objectives for the 3rd set of trials were:

- To assess the effect of a longer sweepline length on the trawl geometry of BT237.
- To undertake underwater observations, using net mounted cameras, of the final redesigned sweepline package.
- To undertake catch comparison tows comparing the performance of the new longer sweepline rig against the shorter rig.

The trawl construction and ground gear specifications were unchanged since the 2019 cruise. BT237 was rigged with a light rockhopper ground gear incorporating 300mm discs in the centre and 250 mm out to the wingends, all rigged onto 16 mm mid-link chain. The hopper discs are spaced 102 mm apart at ground gear centre and then increasing from 178 mm to 356 mm out to the end. The ground gear incorporates 2 bunt assemblies incorporating 4 x 350mm hopper discs at each end. The trawl design incorporates cut-away lower wings, guard meshes and tearing strips and would be considered a robust and simple design compared to the GOV and its standard North Sea ground gear options.

From the previous trials using the MI development trawl gear (ICESWG, 2019) it was felt the shorter sweepline length employed with the BT237 trawl might lead to over spreading in deeper water and compromising catchability. When demersal trawls suffer overspreading the herding performance can be compromised and groundgear catchability reduced for ground fish species such as anglerfish and flatfish. Therefore, a longer sweepline rig was developed taking into account many years of experience gain by MS Scotland in developing survey trawls (deepwater and Anglerfish) and understanding demersal trawl gear performance:

- Short (overall) sweepline length 100.09m. Incorporates 47m x 26mm Ø wire sweep + 40m wire bridles; 20mm Ø lower and 16mm Ø upper.
- Long (overall) sweepline length 131.09m with 68m x 26mm Ø wire sweep + 50m wire bridles; 26mm Ø lower and 16mm Ø upper.

Both sweepline rigs were fished with the same set of Morgere Polyvalent trawl doors incorporating 4.56m (twin) backstrops and 8.53m wire extensions which are standard on Scottish IBTS surveys. As previous trials warp to depth ratio was maintained at 3:1 and the gear towed at 3.7kts (+/1 0.1kt).

The new longer sweep rig gave slightly higher door spreads compared to the short rig and as expected the wingspread was also slightly reduced. Overall the longer sweep gave a more consistent bridle angle over the whole depth range compared to the short rig and significantly lower than the Scottish GOV rig. Headline high was slightly increased and consistent which is possibly indicating a loss of gear drag as the trawl overspreads as water depth increases. This is the reason it’s recommended the GOV sweep length is increased from 47m to 97 m for depths below 70 m.

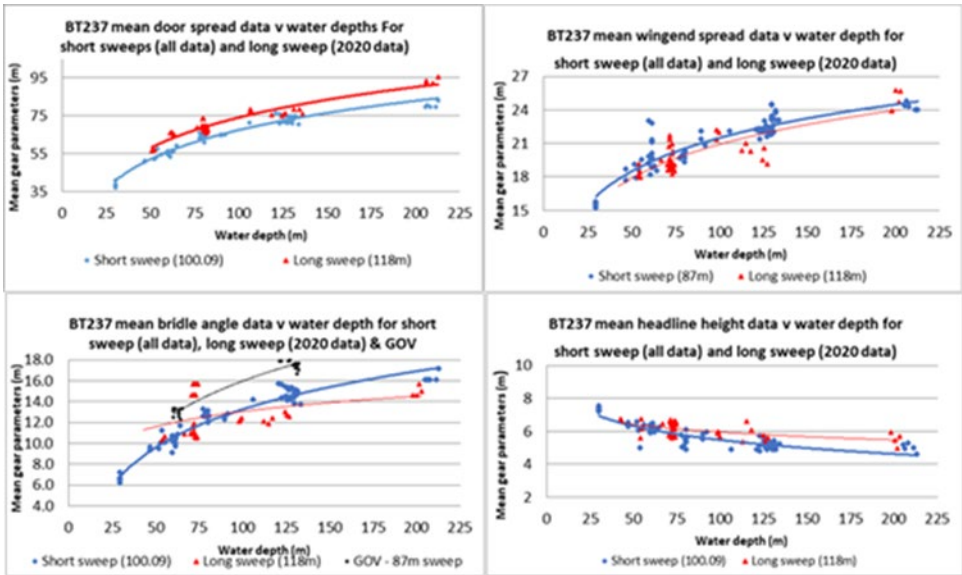


Figure 4.1.1. **Gear performance data comparing long with short sweep lengths.**

Further gear trials are planned by Marine Science Scotland during Oct 2021 to assess the performance of a new trawl door design and the effect of warp/depth ratio on BT237 trawl geometry.

4.2 Method of attaching floats to headline

Melanie Underwood (Institute of Marine Research, Norway) presented two topics related to design and rigging of the GOV trawl with consideration for development of a new trawl for IBTS:

- The effect of method for attaching floats to the headline
- The effect of adding a constraining rope between the towing warps to limit doorspread.

In 2020, IMR tested the effect of changing the way the trawl floats are mounted to the headline of demersal trawls used for surveys. The reason for this investigation was inconsistent performance of several copies of the Campelen 1800 trawl used for surveys in the North Sea, Norwegian Sea and Barents Sea. Also, IMR has been unable to achieve the required opening height for its GOV trawls as specified in the IBTS manual.

It was determined that all trawl designs tested (Campelen 1800, Alfredo 3 and GOV) attained 80-100 cm additional opening height when the floats were attached directly to the headline rather than on short vertical lines between the headline and a second rope ("top rope") added parallel to the headrope. Critical for IBTS, it was found that by attaching the floats directly to the headrope IMR's GOV trawls achieved the trawl opening specified in the IBTS manual. Opening height was also more stable (lower CV in opening height measurements).

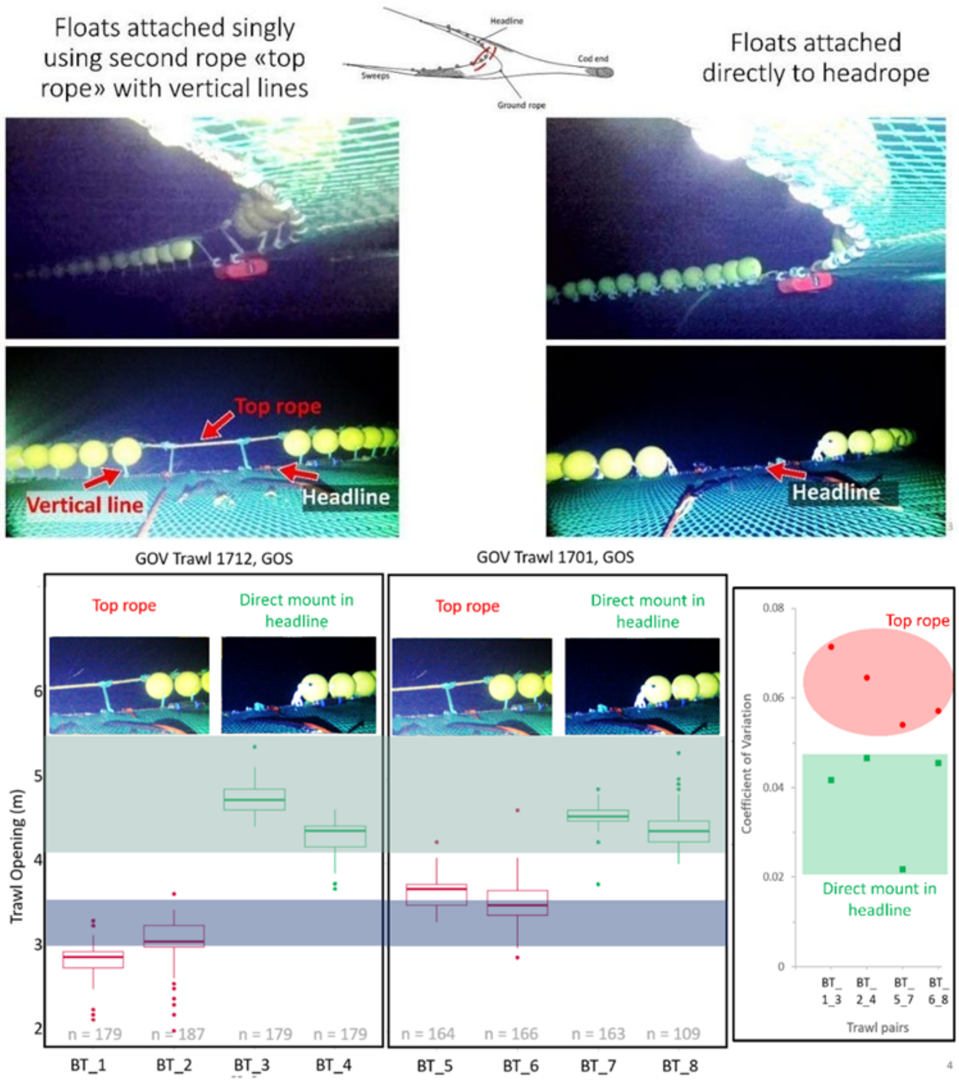


Figure 4.2.1. **Underwater images and trawl opening results from GOV trials attaching the floats directly to the headrope or not.**

4.3 Effect of constraining doorspread

With the exception of IBTS, IMR uses a rope between the towing warps to limit doorspread on all surveys conducted using demersal trawls (three trawl types on seven vessels of different designs). The rope is attached at some distance above the trawl doors and has a measured distance off the seabed. The technique results in constant swept area, sweep angle, and trawl opening height. It also eliminates the need to have different sweep lengths for trawling in different depths.

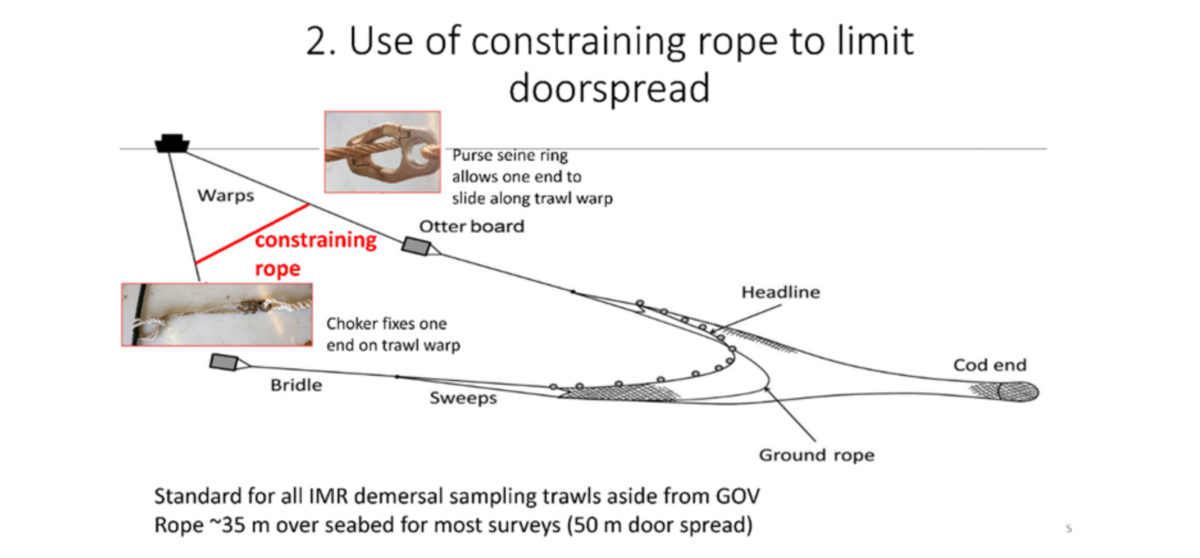


Figure 4.3.1. **Image clarifying the position of the constraining rope and the attachment method used by IMR**

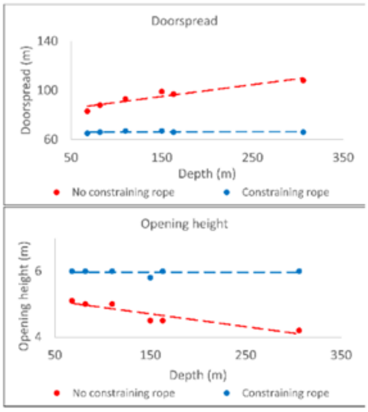
The constraining rope (Figure 4.3.1) is approximately 10 m in length (slightly longer than the distance between the towing blocks) and is attached using a stopper knot on one end and a purse seine ring with a sheave on the other end. In this way warp length can be adjusted independently on each side using, for example, an autotrawl system. The constraining rope is attached by pausing shooting once the appropriate length of warp is out, attaching each end, and then resuming shooting. The procedure is then repeated in reverse during heaving. It adds at most a couple of minutes to the total towing time.

Tests carried out in 1992 with a 9 m constraining rope at 150 m in front of the doors showed that the use of a constraining rope with the GOV trawl resulted in a consistent doorspread (~65 m vs 81-110 m without constraining rope) and trawl opening height (~6 m vs 4.1 – 5.2 m without constraining rope) irrespective of depth (Figure 4.3.2). The use of a constraining rope for the new IBTS trawl would require a quick investigation into the optimal distance between the constraining rope and doors.

Tests of constraining rope with GOV trawl (1992)

Constraining Rope 150 m in front of doors

	Water depth (m)	Warp length (m)	Trawl speed (knots)	Vertical opening (m)	Door spread (m)	Warp depth (150 m)
Without rope	82	400	3.9-4.1	4.9-5.1	85-91	60
Wth rope	82	400	3.9-4.1	5.8-6.1	65-67	61
Without rope	110	460	3.9-4.1	4.8-5.1	91-95	86
With rope	110	460	3.9-4.1	5.9-6.1	66-67	85
Without rope	150	590	3.9-4.1	4.4-4.6	98-99	120
With rope	150	590	3.9-4.1	5.6-5.9	66-68	120
Without rope	68	350	3.9-4.1	4.9-5.2	81-84	49
With rope	68	350	3.9-4.1	5.8-6.1	64-66	48
Without rope	163	600	3.9-4.1	4.3-4.6	96-98	131
With rope	163	600	3.9-4.1	5.8-6.1	65-66	131
Without rope	306	900	3.9-4.1	4.1-4.2	106-110	272
With rope	306	900	3.9-4.1	5.9-6.1	65-67	272



ENGÅS, A., and E. ONA. MS 1993. Experiences using the constraint technique on bottom trawl doors. ICES C. M. Doc., No. B:18, 10 p. https://imr.brage.unit.no/imr-xmlui/bitstream/handle/11250/105125/CM_1993_B_18.pdf

Figure 4.3.2. Results of historic tests using a constraining rope with the GOV-trawl (Engas & Ona, 1993).

During the meeting, questions were raised about health and safety concerns, which may be vessel-specific depending on the positioning of the towing blocks and operation of the winch control system. A request was made for IMR to provide video showing the procedure for attaching and detaching the constraining rope. There was also a question about the effect of the constraining rope on catch rates. This has not been investigated for the GOV, but analyses may have been carried out from tests of the Campelen 1800 trawl in 1992 when the constraining rope was introduced on 1/3 of survey tows.

Minimising variability in geometry is a consideration within the SGSTS criteria we are developing the new trawl by. The question has come up a few times so it is worth clarifying at the planned workshop. We need to balance health and safety concerns against what the benefits might be in the resulting catch. If we have a target sweep angle range for a trawl, based on agreed target species, and we can maintain that range across survey depths then the need should be reduced. However, if sweep angle (herding efficiency) changes significantly with depth and either the target species or sample locations move a lot spatially then the variance in catchability may be argued not to be standardized across years and worth discussing fixing by physical means, like the constraining rope.

4.4 New Survey Trawl sea trials between EVHOE and IGFS

For the past three years, the Marine Institute (MI) in Galway, Ireland has focused on the implementation of as simple a net panel construction as possible under this under this TOR C. Study group meetings on this topic (SGSTG, SGSTS) have highlighted the difficulties in maintaining net mending skills across survey crews even within Institutes, and the cumulative affects mending errors can have on trawl efficiency. The second impetus to a complete audit of the panel design at the outset is it by far the hardest design aspect to modify afterwards.

Following successful trials on RV Scotia in 2019 with both the Marine Science Scotland (MSS) and MI variants of a new survey trawl, feedback was acted on such as some added weight to footrope and the trawl was carried on the IBTS Q4 survey in 2020 for added trials coordinated between the MI and EVHOE survey. Weather was exceptionally poor in 2020 so only 4 paired hauls in the central Celtic Sea were possible, but provided useful information on comparative trawl geometry at depth and catch rates.

Data is very limited obviously, but in terms of geometry the MI trawl had a slightly wider door spread at the lesser depths encountered during the trials, but did not increase in spread to the same extent with depth as the GOV on EVHOE (Figure 4.4.1).

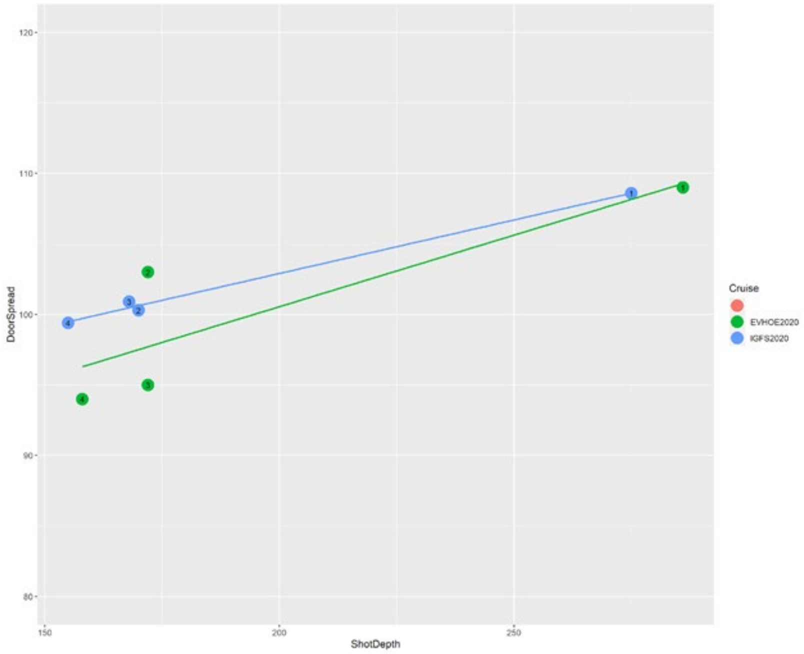


Figure 4.4.1. **Door spread (m) at depth between GOV on EVHOE (green) survey and MI survey trawl (blue) on IGFS survey. Slightly less positive slope for new trawl with these very limited data points.**

In terms of catches the new trawl appeared effective with most abundant roundfish in the catches such as hake (HKE), grey gurnard (GUG) as well as blue whiting (WHB) and whiting (WHG). Where it was expected to perform well due to the smaller 100mm lower wing meshes compared to 200mm in the GOV, was with selectivity for megrim (MEG) and monkfish (MON). Both of these are important target species in the Celtic Sea and catch efficiency initially looks promising (Figure 4.3.2).

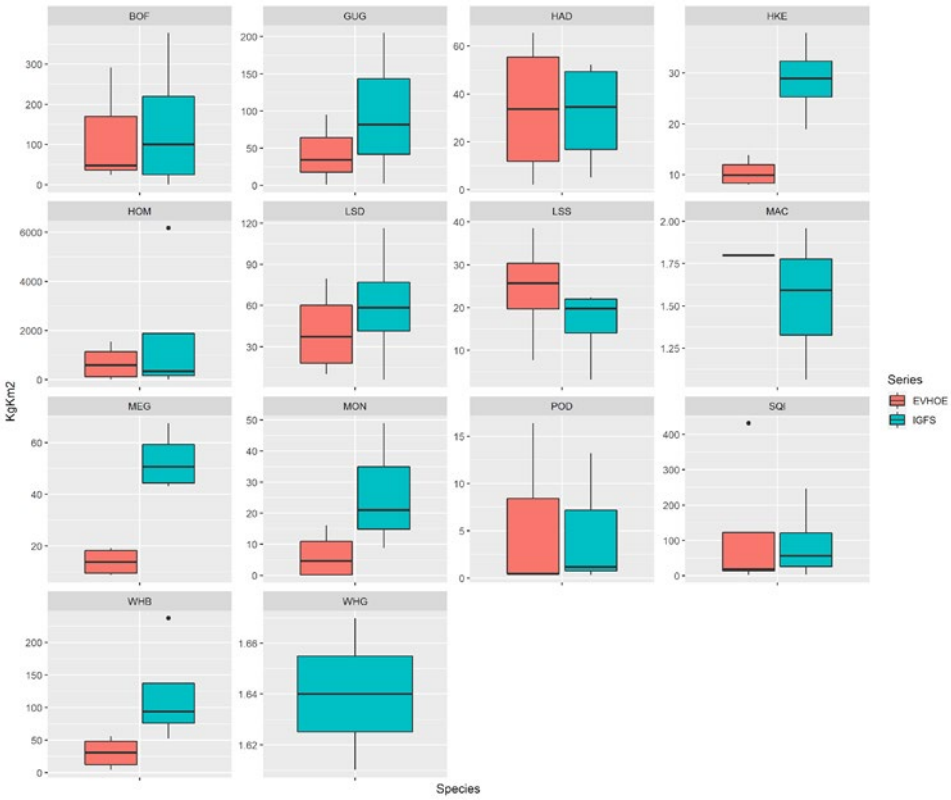


Figure 4.3.2. **Box plots of standardized catch in Kg/Km2 between GOV (red) on EVHOE survey and MI survey trawl (glue) on IGFS survey. Lack of overlap between boxes for hake, monkfish, megrim and blue whiting suggest significant differences between catches for these species.**

Only a cursory look at comparative length frequencies is justified with such a limited data set, but generally suggest similar length ranges and frequency for the abundant species encountered. An exception was blue whiting that suggested the MI trawl appeared to be picking up a stronger signal in juvenile fish (Figure 4.3.3).

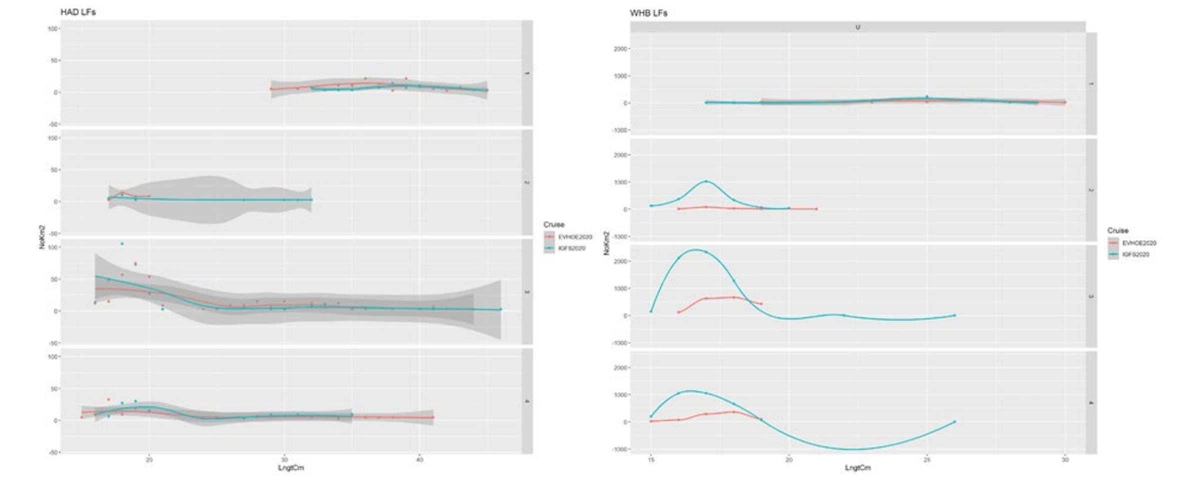


Figure 4.3.3. **Number at length plots of standardized catch in No/Km2 between GOV (red) on EVHOE survey and MI (blue). Haddock (left panel) shows very similar pairwise length range and frequency. Blue whiting (right panel) shows generally greater length range for MI trawl and higher frequency for smaller lengths specifically.**

4.5 Scottish study on warp to depth ratios employed by GOV users 2016 to 2020

ICES currently advise that the warp length to depth (warp/depth) ratio should be adjusted to ensure net geometry remains within accepted limits. The advice, initially given in 2015 (WGIBTS 2015), provides upper and lower limits for the door spread and vertical net opening in given depths. The warp/depth ratio will differ between vessels due to differences between the gear used by each country, and may vary at similar depths as a result of external factors such as ground type, tidal effect and weather condition which affect the net geometry. A study conducted on surveys between 2016 and 2020 for the North Sea IBTS revealed a wide range of warp/depth ratios being selecting by participating countries (Figure 4.5.1). These results could be expected with the current advice to alter warp/depth ratio to fit the net geometry boundaries.

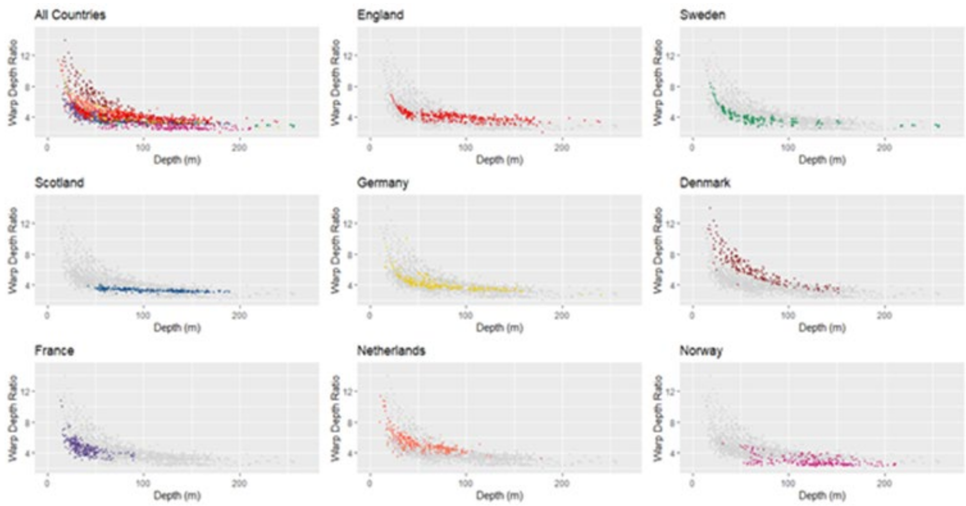


Figure 4.5.1. The warp to depth ratio selected against depth (m) for valid hauls conducted between 2016 and 2020 for countries involved in the North Sea IBTS.

However, further investigation revealed several hauls conducted were outwith the door spread boundaries advised (Figure 4.5.2). It is important to highlight the wide range of door spreads that occur at similar depth, for example at 146m depth the door spread ranged from 42m to 102m. There appears to be a positive relationship between warp length and door spread which would suggest that one possible method for ensuring that the door spread is within the advised boundaries is to adjust the warp length. However, as this is the current advice which is not always achieved, it has highlighted a need for a greater understanding of the decision-making process when selecting a warp length for each tow station. This will be particularly important with a new survey gear being developed as the main objective is to reintroduce national standardisation which, is not the case with the current GOV. Therefore, an improved method for selecting a warp length to depth ratio will be crucial in order to ensure that the net geometry will be consistent between countries for a more standard survey method. This study plans to continue over the next year incorporating more variables to explain the range in the warp/depth ratios being observed, such as the vertical net opening, ground type, sweep length and towing speed. It is suggested that each country completes a short survey to outline their decision-making process when selecting a warp/depth ratio to ensure that the exact reason behind the decision is documented rather than it being inferred form data alone.

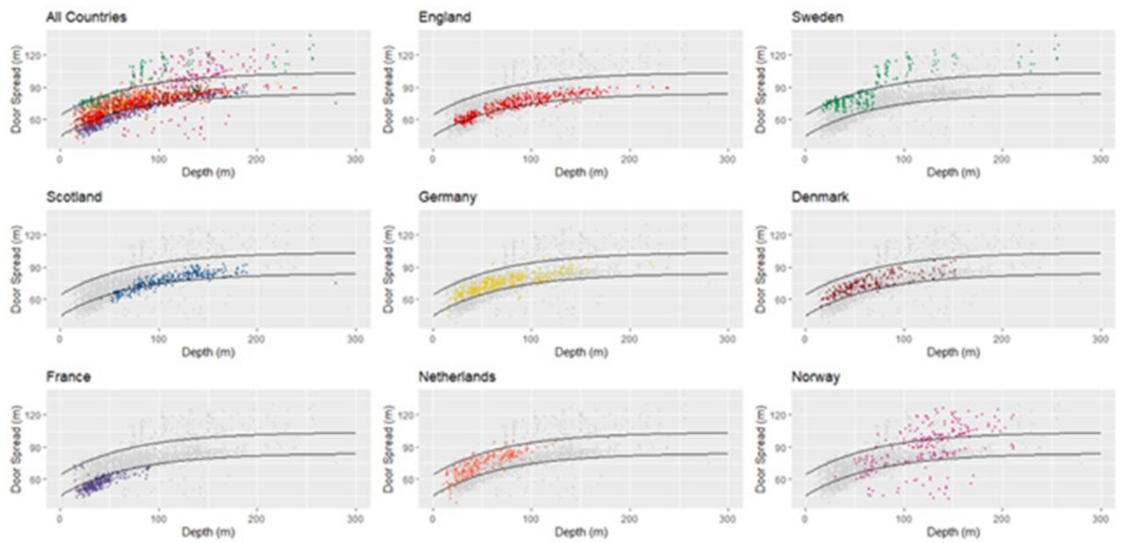


Figure 4.5.2. **The door spread against depth for valid hauls conducted between 2016 and 2020 by countries involved in the North Sea IBTS. The two solid lines represent the upper and lower advised limits by ICES for door spread. It is advised that the warp length to depth ratio is adjusted to ensure the net geometry is within these given limits.**

5 Survey design (ToR d)

5.1 Fishing times outside the nominal tow duration in the North Sea IBTS

Kai Wieland, DTU Aqua, Section for Monitoring and Data, Hirtshals

5.1.1 Introduction

Hatton et al. (2017) reported high bottom trawl catches of herring in so-called zero-minute tows and the catch was taken presumably while the trawl was fishing in the pelagic zone. Based on this, IBTSWG agreed that additional information on towing times outside the nominal tow duration for GOV standard tows, which is the only measured time reported routinely to DATRAS, should be recorded during coming IBTS surveys. Different time steps were defined:

1. Setting the cod end
2. Start firing the doors
3. Touchdown of the trawl on the bottom
4. Stop firing the warps
5. Trawl geometry and vessel speed has stabilized / Start nominal tow duration
6. Start retrieving the warps / End of nominal tow duration
7. Trawl lift-off from bottom
8. End of hauling the doors
9. Cod end on deck

and it was recommended to record time steps 2, 3, 7 and 8 in addition to the standard start and end of the nominal tow duration (ICES 2017).

5.1.2 Material and Methods

The data set for the North Sea IBTS used in the following analysis is listed in table 5.1.2.1 and was compiled from the national data set available at the IBTSWG 2020 sharepoint site. Here, two types of additional towing times were defined:

- Total fishing time outside the nominal tow duration
  Time a = (Time step 8 – Time step 2) – (Time step 6 – Time step 5), and

- Fishing time at bottom outside the nominal tow duration
  Time b = (Time step 7 – Time step 3) – (Time step 6 – Time step 5).

This allows to include tow for which the duration deviates from the standard towing of 30 min. However, the necessary information for all steps has not been available for all countries or all tows for a given country or survey (table 5.1.2.1).

Table 5.1.2.1. Number of observations on fishing times outside the nominal tow duration for the North Sea IBTS (valid standard and experimental tows; *: additional times recorded but not consistent to the definition of time steps 2, 3, 7 and 8; na: no survey scheduled in that quarter).

		Country							
Survey	Time steps for	DEN	ENG	FRA	GER	NED	NOR	SCO	SWE
3Q2017	time a	50	*	na	109	na	74	84	40
	time b	45			109		74	82	36
1Q2018	time a	47	na	35	44	-	83	-	-
	time b	45		-	43		82		
3Q2018	time a	54	92	na	90	na	-	103	25
	time b	47	93		89			100	25
1Q2019	time a	44	na	54	-	-	42	-	34
	time b	36		-			44		31
3Q2019	time a	53	82	na	110	na	-	88	-
	time b	53	83		109			74	
1Q2020	time a	34	na	56	-	-	-	-	-
	time b	26		-					
3Q2020	time a	58	73	na	-	na	-	-	-
	time b	57	75						
total	time a	340	247	145	353		199	275	99
	time b	309	251	-	350		200	256	92

5.1.3 Results

Total fishing times outside the nominal tow duration, i.e., times a, are summarized by country in figure 5.1.3.1. For time a, highest values were reported by England, and a Kruskal-Wallis one-way Analysis of Variance (ANOVA) on ranks indicated significant ($P < 0.001$) country effects, with significant ($P < 0.05$) differences for most of the countries except for DEN - NOR, FRA - SWE, GER - SWE as well as for GER - SCO (Tab. 5.1.3.1). However, times for the different countries originated from different depth ranges and it appears likely that the additional total fishing time is related to depth, i.e., the trawl needs a longer time to reach the bottom at larger depths (Fig. 5.1.3.2). A one-way Analysis of Covariance (ANCOVA) with depth as covariate confirmed this showing significance ($P < 0.001$) for depth in addition to the country effect (Tab. 5.1.3.2). Here, the significant interaction effect between the factor "country" and the covariate "depth" is equivalent to a significant difference in the slope coefficients of the time a – depth relationship between countries which varied from 0.0462 (SCO) to 0.1070 (ENG).

Table 5.1.3.1. Pairwise Multiple Comparisons (Dunn's Method) for total fishing time outside the nominal tow duration by country.

Comparison	Difference of ranks	Q	P	P < 0.050
ENG vs SCO	917.14	21.89	<0.001	Yes
ENG vs GER	851.90	21.50	<0.001	Yes
ENG vs SWE	696.50	12.23	<0.001	Yes
ENG vs FRA	647.21	12.93	<0.001	Yes
ENG vs DEN	304.76	7.63	<0.001	Yes
ENG vs NOR	222.40	4.88	<0.001	Yes
NOR vs SCO	694.74	15.55	<0.001	Yes
NOR vs GER	629.50	14.80	<0.001	Yes
NOR vs SWE	474.11	8.03	<0.001	Yes
NOR vs FRA	424.81	8.11	<0.001	Yes
NOR vs DEN	82.36	1.92	1	No
DEN vs SCO	612.37	15.73	<0.001	Yes
DEN vs GER	547.13	15.00	<0.001	Yes
DEN vs SWE	391.74	7.15	<0.001	Yes
DEN vs FRA	342.45	7.19	<0.001	Yes
FRA vs SCO	269.92	5.48	<0.001	Yes
FRA vs GER	204.68	4.32	<0.001	Yes
FRA vs SWE	49.29	0.79	1	No
SWE vs SCO	220.63	3.92	0.002	Yes
SWE vs GER	155.39	2.85	0.093	No
GER vs SCO	65.24	1.69	1	No

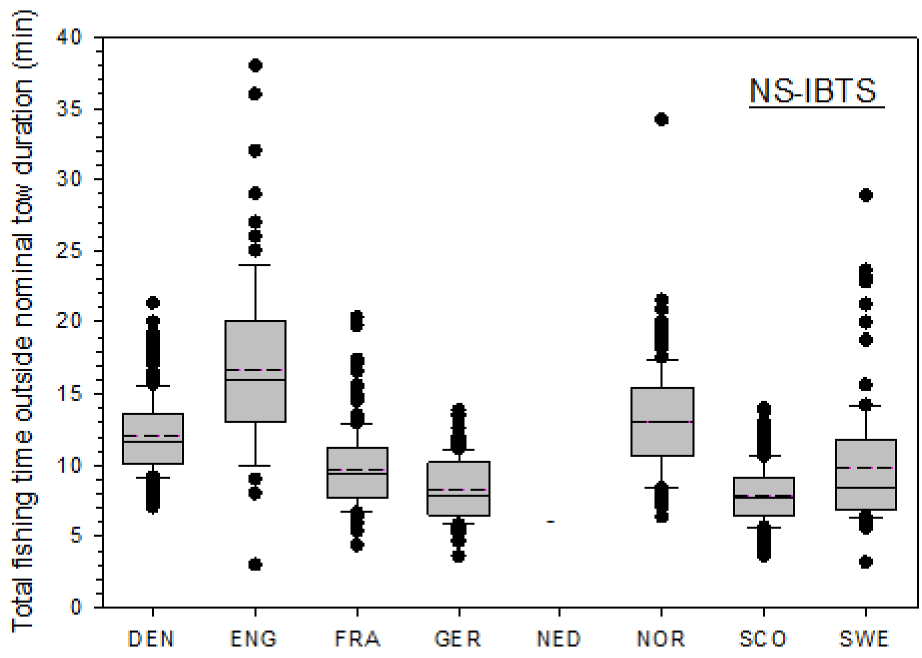


Figure 5.1.3.1. **Box-Whisker plots of total fishing time outside the nominal tow duration by country (horizontal dashed lines: arithmetic mean; solid circles; individual outliers).**

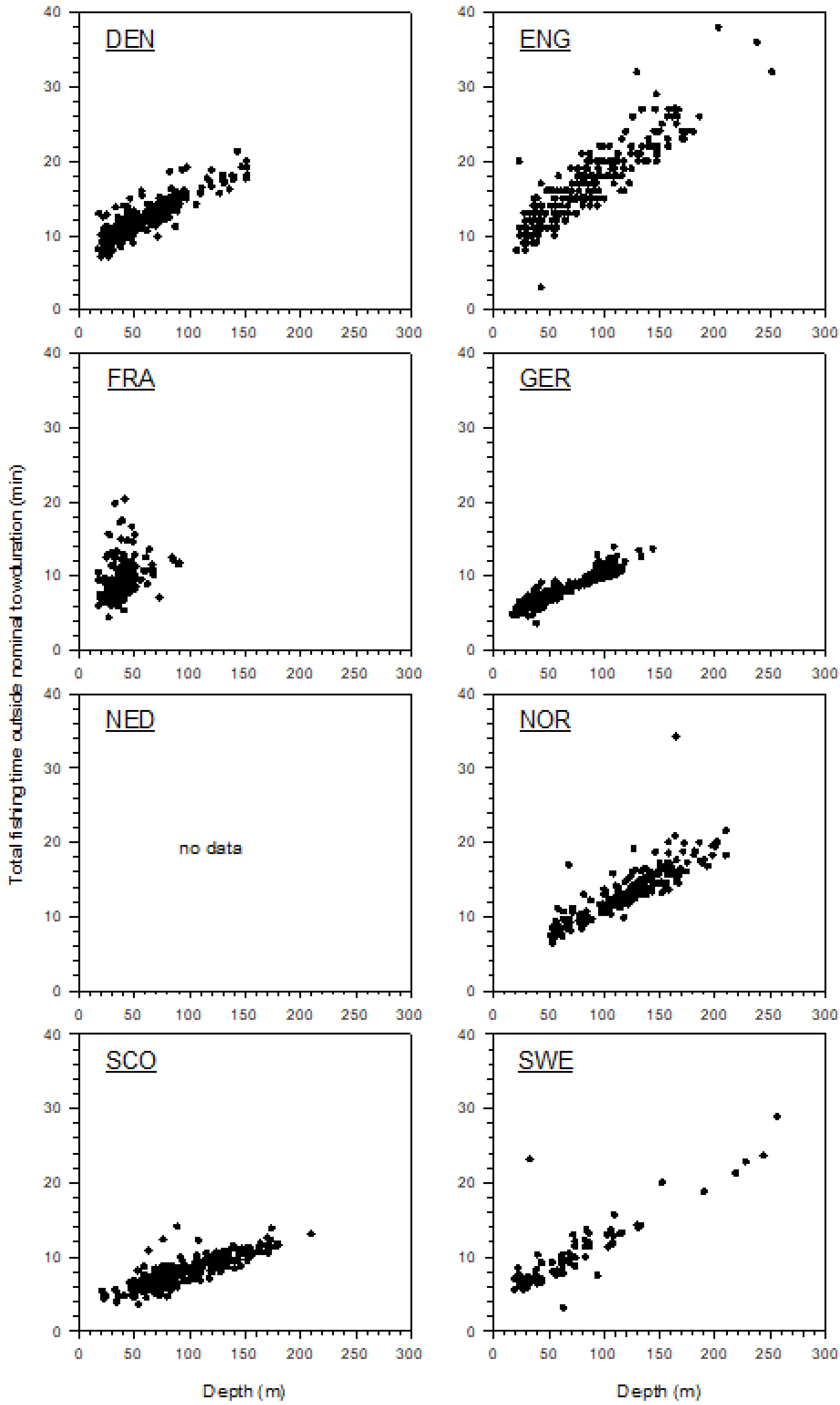


Figure 5.1.3.2. **Total fishing time outside the nominal tow duration in relation to depth.**

Table 5.1.3.2. ANCOVA results for total fishing time outside the nominal tow duration with country as factor, depth as continuous covariate and the interaction term.

Source of variation	DF	SS	MS	F	P
country	6	1007.43	167.90	63.07	<0.001
depth	1	4819.10	4819.10	1810.21	<0.001
country x depth	6	814.46	135.74	50.99	<0.001
Residual	1644	4376.63	2.66	--	--
Total	1657	32594.68	19.67	--	--

Fishing times at bottom outside the nominal tow duration, time b, were higher for England and Denmark than for the other countries (Fig. 5.1.3.3). A Kruskal-Wallis one-way ANOVA on ranks indicates significant ($P < 0.001$) country effects with significant ($P < 0.05$) differences for most of the countries except for DEN - ENG and GER – NOR (Tab. 5.1.3.3).

Table 5.1.3.3 - Pairwise Multiple Comparisons (Dunn's Method) for fishing time at bottom outside the nominal tow duration by country.

Comparison	Difference of ranks	Q	P	P < 0.050
DEN vs SCO	870.52	24.41	<0.001	Yes
DEN vs GER	743.81	22.59	<0.001	Yes
DEN vs NOR	707.67	18.48	<0.001	Yes
DEN vs SWE	235.04	4.69	<0.001	Yes
DEN vs ENG	50.62	1.42	1	No
ENG vs SCO	819.90	21.94	<0.001	Yes
ENG vs GER	693.20	19.93	<0.001	Yes
ENG vs NOR	657.05	16.47	<0.001	Yes
ENG vs SWE	184.43	3.59	0.005	Yes
SWE vs SCO	635.48	12.39	<0.001	Yes
SWE vs GER	508.77	10.29	<0.001	Yes
SWE vs NOR	472.63	8.89	<0.001	Yes
NOR vs SCO	162.85	4.09	<0.001	Yes
NOR vs GER	36.15	0.97	1	No
GER vs SCO	126.70	3.65	0.004	Yes

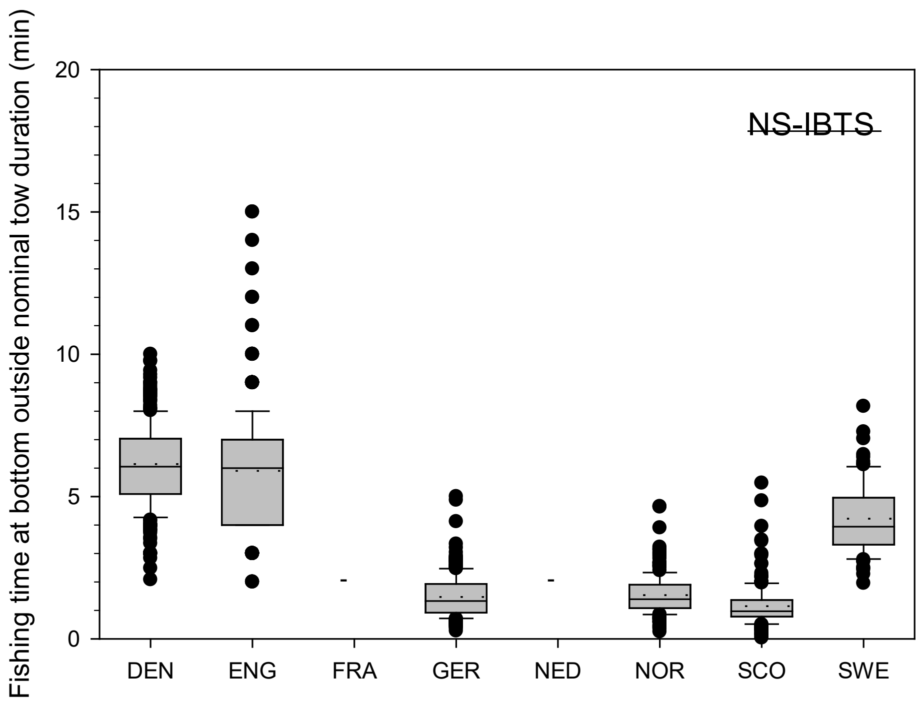


Figure 5.1.3.3. **Box-Whisker plots of fishing time at bottom outside the nominal tow duration by country (horizontal dashed lines: arithmetic mean; solid circles; individual outliers).**

An effect of depth on fishing time at bottom outside the nominal tow duration, time b, was not clearly visible in the first place (Fig. 5.1.3.4). A one-way ANCOVA with depth as covariate, however, revealed a significance (P < 0.001) effect for depth in addition to the country effect and a significant interaction term (Tab. 5.1.3.4). The slope coefficients of the time b – depth relationships ranged from 0.0015 (NOR) to 0.0033 (DEN).

Table 5.1.3.4 - ANCOVA results for fishing time at bottom outside the nominal tow duration with country as factor, depth as continuous covariate and the interaction term.

Source of variation	DF	SS	MS	F	P
country	5	164.38	32.88	216.67	<0.001
depth	1	8.57	8.57	56.48	<0.001
country x depth	5	48.13	9.63	63.44	<0.001
Residual	1448	219.71	0.15	--	--
Total	1459	1129.81	0.77	--	--

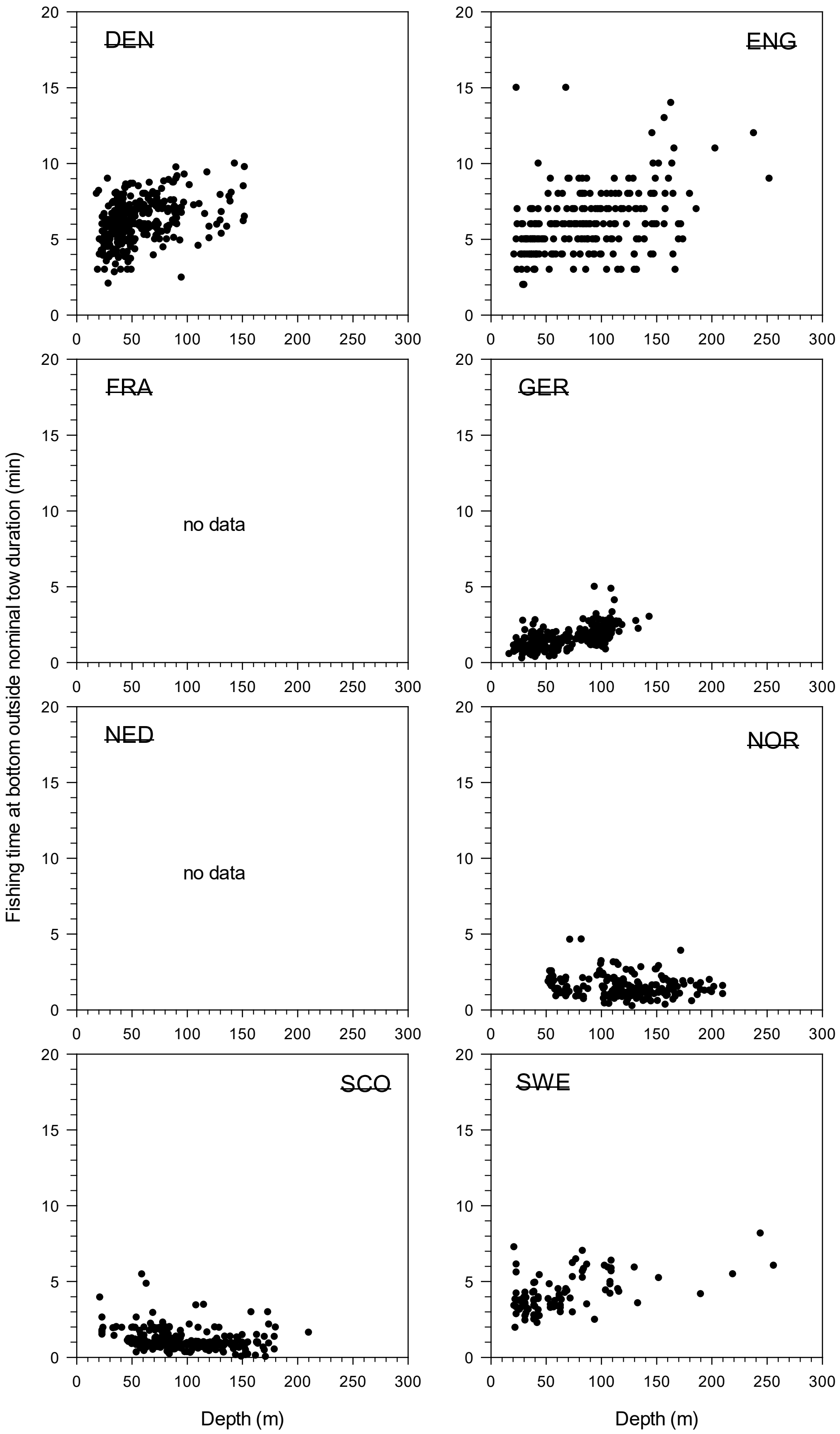


Figure 5.1.3.4. **Fishing time at bottom outside the nominal tow duration in relation to depth.**

5.1.4 Discussion

The results of the present analysis show that fishing time in addition to the nominal tow duration when the trawl is fishing with stable net geometry and vessel speed at the bottom can be considerable. The additional towing time can be assumed to be same irrespectively of the nominal tow duration. The catch received in this period may thus contribute relatively more to the total catch for tows with a shorter duration than the standard 30 min, i.e., 15 min tows. This effect should be more pronounced for pelagic species than for demersal ones considering most of the additional fishing time occurs in the midwater while the trawl is off the bottom. The additional fishing time at bottom explains that on some occasions considerable catches of demersal species can be observed in so-called 0 min tows despite unstable net geometry and vessel speed.

Clear differences of additional towing times outside the nominal tow duration between most of the countries were identified. These are likely related to deviations in the trawl rigging and the handling of the trawl at sea. Despite the standardisation of the GOV trawl and specific guidelines on trawl deployment and retrieval, some of differences appear to be unavoidable due to different vessel specifications, e.g., winch speed and differences between fishing masters. However, an impact on reported catch per unit of effort, in particular for pelagic species, should not be ignored when combining the data from the different countries into overall abundance indices for the entire survey area.

An update of the analysis is planned in order to include in particular data collected by France and the Netherlands in 1Q2021 and/or 1Q2022. This analysis will then also include a corrected and possibly extended dataset for Sweden.

5.1.5 References

Hatton, B., Holmes, I., Ellis, J., and Lynam, C. 2017. Preliminary observations on the catches of fish in 'zero-minute' hauls. IBTSWG 2017, WD6, 9 pp.

ICES. 2017. Interim Report of the International Bottom Trawl Survey Working Group. IBTSWG Report 2017 27-31 March 2017. ICES CM 2017/SSGIEOM:01. 337 pp.

5.2 Preliminary results on the variability of zero-minute tows

Kai Wieland, DTU Aqua, Section for Monitoring and Data, Hirtshals

Sampling was conducted at 13 locations in the North Sea (Fig. 5.2.1a) and at 9 of these location three zero-minute tows were made aside a standard 30 min track which had been fished just before. ANOVA indicated that the position along the standard track is not significant and thus the multiple zero-minute tows were treated as independent replicates.

The zero-minute total fish catches amounted less than 10 % of the neighbouring standard tow catch in the most cases (Fig. 5.2.1b). However, disaggregated catches to fish categories indicated a high variability for in particular pelagic fish but also for demersal gadoids and other demersal fish. For the latter, zero-minute catches were up to three times higher than the catch in corresponding standard tow based on the catch ratios by weight.

Zero-minute tow CPUE was positive correlated with standard tow CPUE for total demersal fish (Fig. 5.2.1c). However, a larger data is required for estimating an end-effect, i.e., the catch obtained during the fishing time outside the nominal tow, with some confidence. An extending analysis including the data collected by other North Sea IBTS participants (see previous IBTSWG reports from 2018-2020) should explore this possibility.

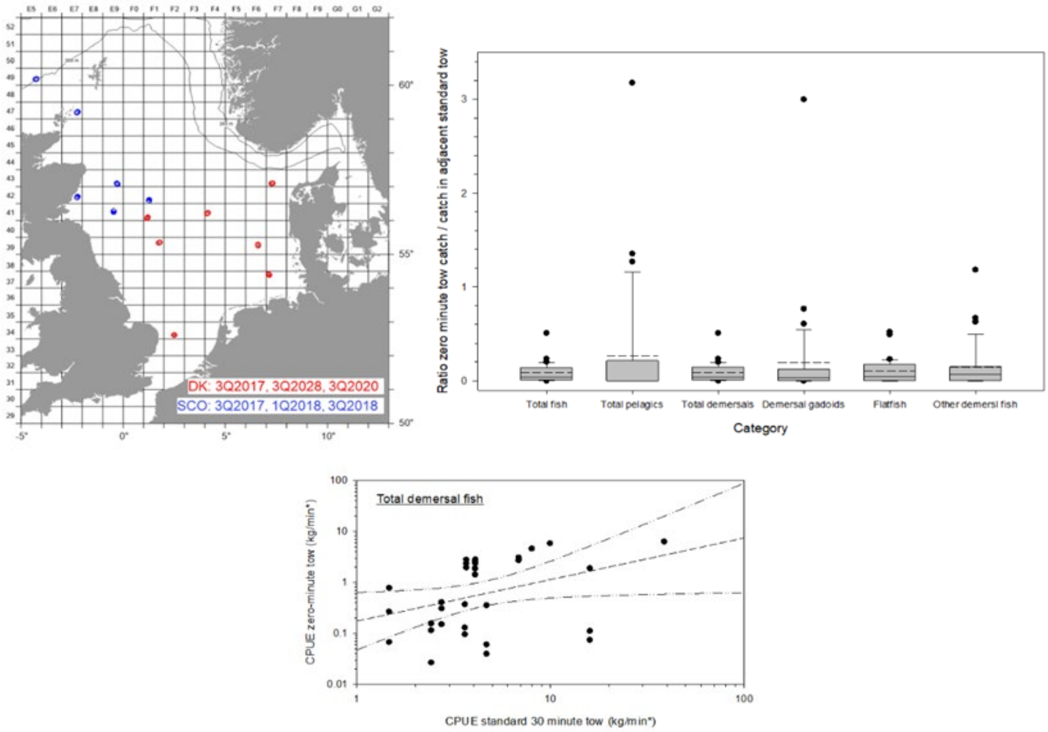


Figure5.2.1. Sampling locations for Danish and Scottish sets of multiple zero-minute and adjacent standard tows, ratios of zero-minute and 30 minute standard tow catches (based on weight) by fish category and comparison of CPUE's for total demersal fish (*:total tow duration, regression with 95 % confidence interval).

5.3 Midwater ring net (MIK) sampling during 1st quarter IBTS in the North Sea - survey design considerations

During the annual Q1 IBTS in the North Sea, night time sampling with a 2m midwater ring net (MIK) plankton sampler aims at catching large herring larvae in order to provide the Herring Assessment Working Group (HAWG) with a recruitment index for North Sea herring. Discussions on IBTS survey design in preparation of and during the Workshop on Impacts of planned Changes in the North Sea IBTS (WKNSIMP) raised concerns among members of WGSINS (the coordinating body of MIK sampling in the North Sea) that changes in the survey design of the Q1 IBTS could negatively impact the night-time MIK sampling. In order to investigate those impacts, possible reductions in sampling effort on the results of the MIK survey were tested. These tests showed that effort reductions up to 50 % wouldn't severely affect the perception of the trends in herring 0-ringer abundance in each winter in the North Sea. The results were communicated with WGSINS asking to evaluate and redefine the objectives of the MIK survey in order to possibly adjust the MIK survey effort. WGSINS discussed possible reductions but concluded that this was not advisable. While the MIK survey was originally designed to solely collect data on herring larvae, with more and more participants recording also other larvae, more species came into focus for further research. This was particularly true for larvae of lemon sole, which could be used as a recruitment indicator for the species' stock in the North Sea. Also, in the most recent years, large sardine larvae appeared regularly in considerable numbers in the winter-plankton of some North Sea areas. These larvae are not only able to severely confound the counts of herring larvae, because they are easily confused with each other, they may also serve as an indicator for changes in the ecosystem. Larvae of those two species, however, are not as abundant as herring larvae, and WGSINS therefore concluded that effort reduction would be prone to severely affect their abundance estimate and those of other species that may become of interest. The group therefore recommends to stick to the "4 MIK per statistical rectangle" rule.

6 Combined session with assessment groups

The IBTSWG received a recommendation by WGNSSK to open the channels of communication. Next to this recommendation the IBTSWG chairs received a number of questions from WGEF and the Benchmark process on North Sea plaice. To answer these a session was organised in which next to the IBTSWG-members also some of the stock coordinators of WGNSSK, one of the chairs of WGEF and one of the leads in the plaice benchmark process participated.

The chair of WGEF (Jurgen Batsleer) presented their assessment process and some of the issues they had dealing with the using the IBTS data. This largely focussed on their wish to calculate indices based on swept area. They were unaware of the available FlexFile and had been trying to calculate the swept area themselves. These questions resulted in a discussion on the use of the FlexFile(s) in their assessment process.

Chen Chun, from the plaice Benchmark process, presented her work analysing the plaice data including the NS-IBTS. It focussed mainly on the UK-waters around Scotland, were in the latest years larger amounts of plaice are found, not only adults but also juveniles. Her questions were directed at the types of GOV used in this area and the impact of this on the catchability of plaice. Specifically, the group noted that the rock hopper otter trawls used by some Scottish vessels could have a lower plaice catch than other gears. It was suggested that the inclusion of a vessel or survey covariate in the plaice model could be tested to see if this improved the model fit. Furthermore, there were questions related to the differences in growth rate between this northern area and the more southern North Sea, which is a known phenomenon. However, this might influence the index as the number of otoliths from the northern area is limited and in the ALK estimating she presented she had to borrow from other areas or from the NS-BTS in Q3 as well. Statistically, it was suggested that the effect of this in the model could be tested by using aging data from different years rather than different regions. More pertinently, she therefore requested to ensure the continuation of the collection of plaice otoliths from this region and make sure these are aged. To which Scotland could respond that they have a relatively new age reader for this species that has been reading the otoliths of latest years enabling the accessibility of these data. There is no discontinuity in the aging time-series related to the start year of the new age reader, and the new Scottish age reader has participated in the age reading exchange organised by WGBIOP last year. Otoliths from Belgium and the Netherlands were used in this exchange, it would be good to include some otoliths from the northern area in a next exchange as well.

These presentations and discussions were followed by a plenary discussion on the recommendation by WGNSSK, together with one of the chairs of WGNSSK. They have invited the IBTSWG to give a short presentation at the start of WGNSSK to give an update of the recent surveys relevant for WGNSSK. The IBTSWG firstly pointed at our highlights of each survey and indicated to WGNSSK that it would be very difficult to give more insight than that on all stocks using data from the IBTS, especially in a short presentation. So, it was discussed that it would be much more useful if the relevant stock-coordinators of WGNSSK, the full list currently unknown by the IBTSWG, would get in contact with the regional coordinators of the NS-IBTS (Kai Weiland Q3, Ralf van Hal Q1) or with the chairs of the IBTSWG, to discuss stock specific issues in the weeks prior to WGNSSK. Next to that, it was discussed that the presentation on WGNSSK could than better focus on the more general topics the IBTSWG would like to discuss with WGNSSK:

- Experiments and ideas developed by IBTSWG on changing survey design.
- The current process on changing the gear.
- The changes in otolith collection on the potential implications of that on the ALK-calculation.
- The issue of index calculation by survey leaders for certain stocks/coordinators (methods, traceability, implementation of R-scripts in Datras).

The discussion between the groups were well received on all sides. It also made the IBTSWG to consider a ToR for the new cycle that focusses on improving the contact with the end-users of the IBTS data.

Following, the session with WGNSSK a short presentation on the results of WKNSCodID and WKNSEA 2021 was given by Yves Reecht (participant IBTSWG and WKNSCodID). The stock coordinator from WGNSSK stayed online and added some additional information on the status. Based on the material combined in the WKNSCodID the most plausible scenario is that three cod stocks occur in the North Sea, see WKNSCodID figure 4.1. All three are caught by the North Sea surveys, the Northwest population is caught by the Scottish WCGFS. The delineation of the stocks does not fully match with the roundfish areas of the NS-IBTS. For recent data on age, this is no issue as the otoliths are now collected by hauls, however the older age data might cause issues as those were collected by the round fish areas. The current calculation of the ALK on Datras also uses the roundfish area, which as shown does not match with the stock structure. Using the current ALKs might result in using age information of the other stock.

The same issue came up later in the week, when the Data center reported that they were requested to make separate indices for withing splitting the North Sea stock in two (Paragraph 3.5). Also, here the delineation did not match with the roundfish areas and as a result using the historic age data and the current ALK calculation on the current data could result in using age information from the wrong stock.

7 RCG stomach collection

A presentation on a "Regionally coordinated stomach sampling program" was given by Pierre Cresson (IFREMER), who summarised on-going work under the Regional Coordination Group for the North Atlantic, North Sea and Eastern Arctic (RCG NANS&EA) and their Intersessional Study Group on Stomach Sampling (ISSG "Stomach sampling").

IBTSWG were invited to comment on the outline proposal for future sampling of fish stomachs during the North Sea IBTS in both Q1 and Q3.

The IBTS has long-served as a platform for the collection of additional biological data. Previously, co-ordinated stomach sampling programmes during IBTS were conducted in 1981 (Daan, 1989) and 1991 (ICES, 1997). The stomach sampling conducted in 1981 and 1991 focused on five main species (cod, haddock, whiting, saithe and mackerel), although further species were also sampled in 1991 study, including 'secondary species' (e.g. horse mackerel, gurnards, skates and rays, and long-rough dab; Table 7.1). A smaller coordinated stomach sampling programme took place during the IBTS Q1 and Q3 in 2013, as part of a Mare tender project let by DTU-Aqua (Huwer et al. 2014). As part of this programme Denmark, Germany, Netherlands, Sweden, UK and Norway collected sampled for grey gurnard, mackerel and hake. The protocol followed on board was very similar to the currently proposed protocol and is later included in FishPi2 (Anon., 2019).

Table 7.1. List of other fish species sampled for stomach contents analysis in 1991 and their sample sizes. Adapted from ICES (1997). Species denoted * were identified as 'secondary predators' for sampling by ICES (1991).

Common name	Scientific name	N
*Spurdog	*Squalus acanthias*	518
*Lesser-spotted dogfish	*Scyliorhinus canicula*	175
*Tope	*Galeorhinus galeus*	32
Starry smooth-hound	*Mustelus asterias*	7
*Starry ray	*Amblyraja radiata*	3201
*Cuckoo ray	*Leucoraja naevus*	192
*Thornback ray	*Raja clavata*	206
*Spotted ray	*Raja montagui*	133
*Conger eel	*Conger conger*	0
Blue whiting	*Micromesistius poutassou*	7
*Pollack	*Pollachius pollachius*	81
Bib	*Trisopterus luscus*	102
*Tusk	*Brosme brosme*	27
*Ling	*Molva molva*	204
*Hake	*Merluccius merluccius*	549

*Anglerfish	*Lophius piscatorius*	260
Norway haddock	*Sebastes viviparus*	7
*Red gurnard	*Chelidonichthys cuculus*	170
*Tub gurnard	*Chelidonichthys lucerna*	391
*Grey gurnard	*Eutrigla gurnardus*	11700
* Horse mackerel	*Trachurus trachurus*	3513
Striped red mullet	*Mullus surmuletus*	26
Wolf-fish	*Anarhichas lupus*	3
Greater sandeel	*Hyperoplus* sp.	794
Unspecified sandeels	Ammodytidae	65
*Megrim	*Lepidorhombus whiffiagonis*	244
*Turbot	*Scophthalmus maximus*	88
*Brill	*Scophthalmus rhombus*	27
*Long-rough dab	*Hippoglossoides platessoides*	2513
*Halibut	*Hippoglossus hippoglossus*	11

The recent FishPi2 project (Anon., 2019) updated a manual for stomach contents sampling and trialled the protocol. This project suggested that a rolling 5-year programme would be the most beneficial (Table 7.2), whilst minimising impacts on the surveys themselves.

There were, however, some possible misperceptions in this suggested programme. For example, the list of 'species not sampled for biology' included species that are already biologically sampled by some nations, and horse mackerel, which was listed as a species that is biologically sampled during the IBTS, is only sampled by Norway and not currently sampled by other nations.

Table 7.2. Suggested schemes for fish stomach sampling during the IBTS as indicated in the FishPi² project (top; Anon., 2019) and as suggested during the 2021 IBTSWG meeting.

Survey area	Year	Species sampled for biology	Species not sampled for biology
North Sea IBTS	1	Whiting Anglerfish	Megrim
	2	Horse mackerel	Starry ray
	3	Saithe Mackerel (Q3 only)	Gurnard
	4	Cod Plaice	Halibut

	5	Haddock Hake	Turbot

Survey area	Year	Species sampled for biology	Species not sampled for biology
North Sea IBTS	1	Whiting	Megrim Anglerfish*
	2	Horse mackerel Plaice	Starry ray Rays and skates**
	3	Saithe	Grey gurnard Red gurnard
	4	Cod Mackerel (Q3 only)	Turbot
	5	Haddock Hake	Halibut

* Anglerfish = *Lophius piscatorius* and *L. budegassa*

** Rays and skates = *Raja montagui, R. clavata, Dipturus batis*

IBTSWG considered that a rolling programme would be a more pragmatic approach than trying to sample all species in a given year. However, the following points were noted:

1. Some of the species of interest (e.g. halibut and turbot, but also species examined in the 1991 Stomach Sampling Project such as brill, pollack, torsk, ling) are usually found in low numbers. Given the low numbers encountered, that some of these will be below the length threshold, and that some species (e.g. ling) may have high levels of regurgitation, it may be a more robust approach to sample such species each year.

2. Some species, primarily elasmobranchs, are often released alive during some surveys, and some species are included in on-going tag-and-release programmes. It may be more appropriate to stipulate that only dead specimens of these species should be used for stomach contents, but that data be collected each year. This would maximise the data collected from any dead specimens without requiring the euthanasia of such species for an 'annual' study of stomach contents.

3. Some other fish species, including known piscivorous species, that were sampled in 1991 were not explicitly identified in FishPi[2] (Anon., 2019). Hence, there may be some merit in also considering such species in any future studies, depending on resource and interest from the data users. Species such as long-rough dab, brill, pollock, tusk, ling as well as spurdog and tope (see also the previous bullet), were 'secondary species' in the 1991 Stomach Sampling Project.

4. In some of the participating countries the collection of stomachs (tissue) of fish species is considered part of the Experiments on Animals Act. Approvals for collecting biological samples (otoliths) from the target species are provided, and collecting the stomachs of these fish will be seen as additional use of the same experimental animal. However, collecting stomachs of

additional species, incl. the elasmobranches, will require additional approvals with the chance of rejection in case the statistical support for the amount of stomachs to be collected is considered insufficient. This is seen as a serious issue related to the rarer species for which statistical support for the likely low number of stomachs to be collect will be difficult. Referring to these species as being dead already after catching, as suggested above for a part of the elasmobranches, is not an excepted argument for not considering these as experimental animals unless it can be proven that the animals have died during catching.

5. In terms of skates and rays, cuckoo ray *Leucoraja naevus* is also a piscivorous species (Ellis *et al.*, 1996), and so that this species could usefully be considered in the list of skates and rays. Similarly, 'gurnards' were identified as a group but only the more abundant red and grey gurnards were specified, whilst the larger-bodied tub gurnard is also known to be piscivorous (Vallisneri *et al.*, 2011; Stagioni *et al.*, 2012).

6. As well as considering potential sample sizes, the distributions of species could also usefully be considered when developing a rolling programme, especially so as to minimise cases where the main species to be sampled are sympatric in parts of the survey area. This would allow the extra work to be spread out across the survey.

7. It may also be pragmatic to include some species that are sufficiently frequent, but not very abundant, in the first year of the programme, in order to help all participating nations better embed the work and methods into their surveys.

8. Hence, if such a study were to get the funding and support to go ahead, it is suggested that the rolling programme be re-examined. A potential alternative rolling programme is shown in Table 7.3 for illustrative purposes. However, any finalised rolling programme should be decided after consultation with survey leaders, which IBTSWG would be able to coordinate.

Table 7.3. Potential alternative scheme for fish stomach sampling during the IBTS. This is shown for illustrative purposes only. Species identified by FishPi[2] denoted in bold and relate to the species of greater interest to WGSAMM. Species not in bold were not identified by WGSAMM or specified in the ISSG presentation, and so data may not be required, although these species are all known to be piscivorous and were included in earlier stomach sampling programmes.

Survey area	Year	Common species (those species not normally sampled by most surveys are given in parentheses)	Species sampled for biology (minor)	Species to be sampled opportunistically each year (dead specimens; live specimens are generally released)
North Sea IBTS	1	**Cod** **Anglerfish**	**Turbot** Brill **Halibut** Pollack Torsk Ling [Tub gurnard]	**Starry ray** Cuckoo ray **Thornback ray** **Spotted ray** **Common skate-complex** Spurdog Tope
	2	**Whiting** **Megrim** **[Horse mackerel]**		
	3	**Saithe** **Hake** **Mackerel (Q3 only)**		
	4	**Haddock** **Plaice**		
	5	**[Red gurnard]**		

	[Grey gurnard]

The sampling details suggested by the FishPi[2] project (Anon., 2019) are commented on in Table 7.4. The FishPi[2] project provided a useful draft protocol for stomach contents sampling. If future funding for new stomach sampling programme is secured, and it was to be conducted during IBTS, then it would be useful to establish a Planning Workshop to finalise and agree the protocol, species and time-frame for this work.

Table 7.4 - Comments on some of the suggestions made for stomach sampling by the FishPi[2] project.

Suggestions from the FishPi[2] project (Anon. 2019)	Initial comments from IBTSWG
Five stomachs should be sampled per 5-cm length group of each predator species from on average every fifth haul resulting in a total number of stomachs sampled per 5-cm group by a country in a given survey, which is equal to the number of hauls performed by a given country. This was subsequently updated by the ISSG protocol that recommended that fish be sampled in every haul.	The sampling regime may be better set by either day or roundfish area for the more common species. Sampling by 'every 5th haul' could lead to confusion on board. Species caught more sporadically should be sampled when caught and inferring such constraints could result in limited sample sizes being collected. Hence, the collection of stomach contents would be needed across individual hauls.
A wide geographical coverage of samples should be obtained whenever possible	This is a sensible approach and, collecting samples per survey day or roundfish area would also facilitate this.
No more than two specimens should be taken per cm group and square.	This seems a sensible approach, but does 'square' refer to ICES Rectangle?
Stomachs should be selected randomly within 5-cm groups, but can be taken from fish sampled for maturity and age determination	Most of the species to be sampled are already sampled biologically by several nations, and it would be more pragmatic to use these same fish, as was also noted under the ISSG protocol.
The stomachs are frozen individually in plastic bags together with a label describing the sampled fish.	Appropriate, though the freezing and thawing process may damage softer-bodied prey, which could hamper subsequent laboratory analyses for some prey groups.
Only predators larger than 15 cm *should be sampled as fish below this size are generally not piscivorous*	The 1981 study used a minimum size of 10 cm (ICES, 1989) and this was reduced to 5 cm in the 1991 study (ICES, 1997). The exclusion of smaller (<15 cm) fish could limit the broader dietary information for ecosystem models. However, from a practical viewpoint, the suggested 15 cm threshold will reduce the impact on the survey, and will enable focus on larger individuals, which are expected to be more piscivorous. Furthermore, as stomachs are being frozen, the smaller prey items found in smaller fish may not be easily identifiable after the freezing/thawing process, and so may not yield useful results. Consequently, a 15 cm threshold would be a useful approach, and this is also in the ISSG protocol.

Everted stomach. Some fish have everted stomachs due to the pressure difference between trawling depth and the surface of the sea. Since it not known whether these stomachs contained food or not, such ones should not be sampled	This is appropriate and consistent with earlier programmes.
Stomach showing evidence of regurgitation. Some fish have regurgitated all or part of their stomach contents and these stomachs should not be sampled. The number of such stomachs encountered during the examination must however be recorded to ensure that the proportion of feeding fish in the sample is accurately defined. *In practice, it is often difficult to tell whether regurgitation has taken place, except in situations of prey remains in mouth or pharynx. However, if the stomach is flaccid or its wall is thin but contains no or little prey remains, experimental work by Robb (1992) indicates that the size of the gall bladder is a useful indicator of the recent feeding history of the fish. A large densely-coloured gall bladder indicates that the stomach has been empty for some time and has not recently lost its content by regurgitation. The criteria are summarized in Table 1 and should be applied when classifying a stomach as either being truly empty or originating from a fish that shows signs of regurgitation.*	This is appropriate and consistent with earlier programmes. Whilst Robb (1992) reported that the gall bladder was a useful feature, that study was undertaken for whiting. Have the criteria developed by Robb (1992) been shown to be consistent for other fish taxa? Furthermore, there is the potential for observer bias in these criteria, and so gall bladder information may not be useful.
Non-everted stomach showing no evidence of regurgitation – with or without contents – should be sampled. It should be noted that not all feeding fish have significantly distended stomachs, i.e. feeding does not necessarily mean full.	This is appropriate, in order that a robust indication of feeding intensity be developed.
Empty stomach is included in the category Stomach of a fish showing no evidence of *regurgitation.*	This is appropriate, in order that a robust indication of feeding intensity be developed.

7.1 References

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8 Open session

The open session was to present work using data of the IBTSWG surveys or to present work that has relevance for the performance of the surveys. In the section below a summary of the presentations is given. This does not necessarily reflect the opinion of the IBTSWG, it is a representation of the presenters view only.

8.1 "Measuring boards" (Presentation from David Stokes)

In 2019 the Marine Institute (MI), Galway, instigated a project to replace its existing electronic measuring board system. This was a CEFAS developed system based on bar code technology had been in place since 2000. Several off the shelf systems, and some in development, were reviewed as part of the WKSEATEC[1] workshops and project tender process, but a custom solution was finally selected. The new system, Electronic Fisheries Data Acquisition system (EFDA, Figure 8.1.1) uses RFID (Pit Tag) technology so a simple unwired board containing tags, a tag reading wand and a windows PC.

Figure 8.1.1. The new Electronic Fisheries Data Acquisition system (EFDA).

The key points highlighted to the group in in the presentation were:

a) Unexpected benefits of starting with a blank design
b) Greater utility and complexity of a dynamic data model
c) Enhanced real-time QC of data in

[1] https://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=34161

8.1.1 Design

Often the approach with technology upgrades is to take what is already done as being the best approach and try to enhance that with faster and better technology. In the current project, an early user workshop highlighted that workload in the fishroom tended to pass sequentially from the deck-master (DM), managing the fishroom, to the samplers and back again. There was significant time one would be busy while the others were not and vice versa. This alternating work process flow was addressed then by implementing a networked solution where the DM undertook to enter some extra sample data on the keyboard which allowed samplers to select the correct sample metadata from a pre-populated list on their networked measuring boards. This greatly reduced the data entry time required to set up for a sample not having a regular keyboard, as well as input errors. In exchange a lot of the data QC done by the DM after the haul is complete is now duplicated in the sampling application. In this way the person who has just completed the sample has first eyes on the quality plots to check for outliers or abnormalities while everything familiar and the actual sample still present. The combination of these two focus areas has speeded up sampling and reduced errors significantly in first trials on surveys in Q4 2020 and Q2 2021.

8.1.2 Data model

Given expanding interest in the previous system among staff and the ever-expanding role of research surveys, it was felt desirable to build as much flexibility onto the system as possible. To that end the app simply parses data into a freely available database system MySql. In addition, the basic model generally only requires a User ID, a sample number (i.e. Haul number) and a species code. After that any number or type of data fields can be added, validated and made exclusive to any other if required. For example, length, category, sex and weight can be collected for all species while gutted weight is collected for cod only. Otolith targets by species and length are implemented, but a late sample request in IGFS2020 required we implement new targets in EFDAQ during the survey. This was for genetic fin clips for one species to be collected by strata with samples stored in 25 cell trays in the freezer. The DM can also get a report back by species for any sampling set up, current sample tally and where they should be located.

Working directly in the database tables of a dynamic model like this requires an extra query step compared to the previous static tables approach with pre-defined table columns, but flexibility to track and QC evolving data collection is a significant benefit.

8.1.3 Data quality control (QC)

Some key data QC checks had evolved over the years on the survey and were implemented in R. This meant some set up when changing machines and also required all the data to be downloaded to the DM machine after the haul was complete, before checks could be run. The current networked approach allowed checks to be made immediately on the sample just collected by the person who just collected it (Figure 8.1.3.1 - 8.1.3.5). While what they could actually edit is slightly restricted for operational reason, the ability to trap issues while the sample is still available has been very beneficial. The added feedback to samplers on how their data appears in relation to overall sampling on the survey has also been beneficial.

For species where, only length samplers are taken a minimum of two Data QC screens must be responded to. For samples collecting individual weights and/or otoliths etc. a further two screens must be passed through before you can confirm the sample is complete and it is available for the DM to check and approve as final.

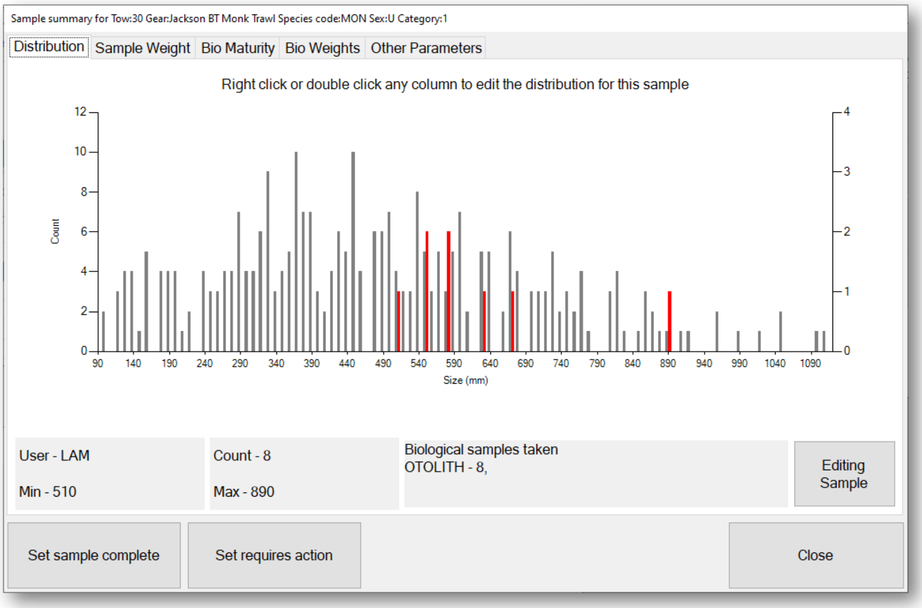

Figure 8.1.3.1. **Screen #1 Distribution: gives the length frequency just measured (red) against the frequency for the survey so far.**

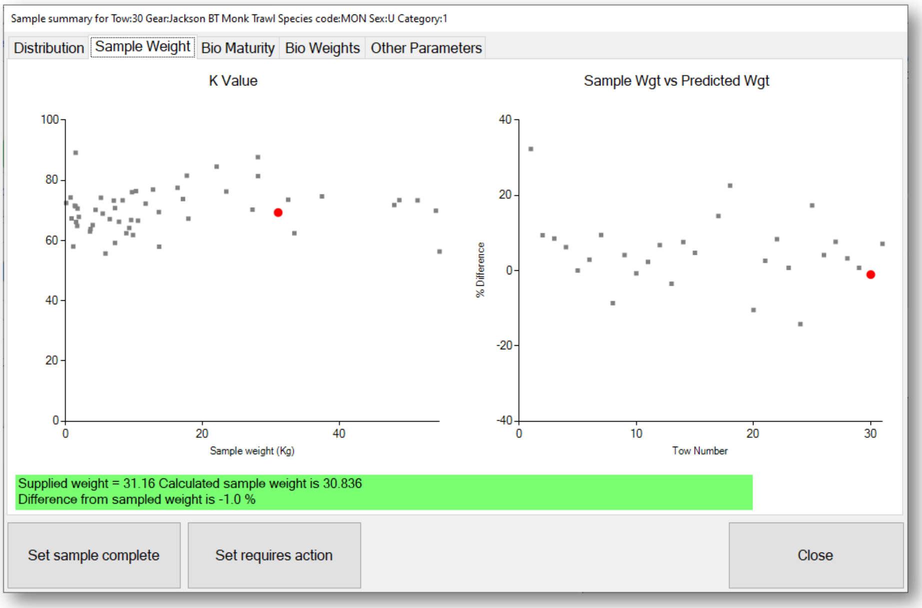

Figure 8.1.3.2. Screen #2 Sample Weight: gives an estimate of sample weight based on a simple cubic relationship between length and weight within the length frequency vs the actual sample weight entered for the sample (left panel). Where actual a and b growth parameters are available in the database a more accurate estimate of predicted sample weight vs entered sample weight is given as % difference (right panel). For measured only species, once this screen has been viewed the "Set Sample Complete" button is active and sampler can sign off on the sample and move straight to sample list for the next sample.

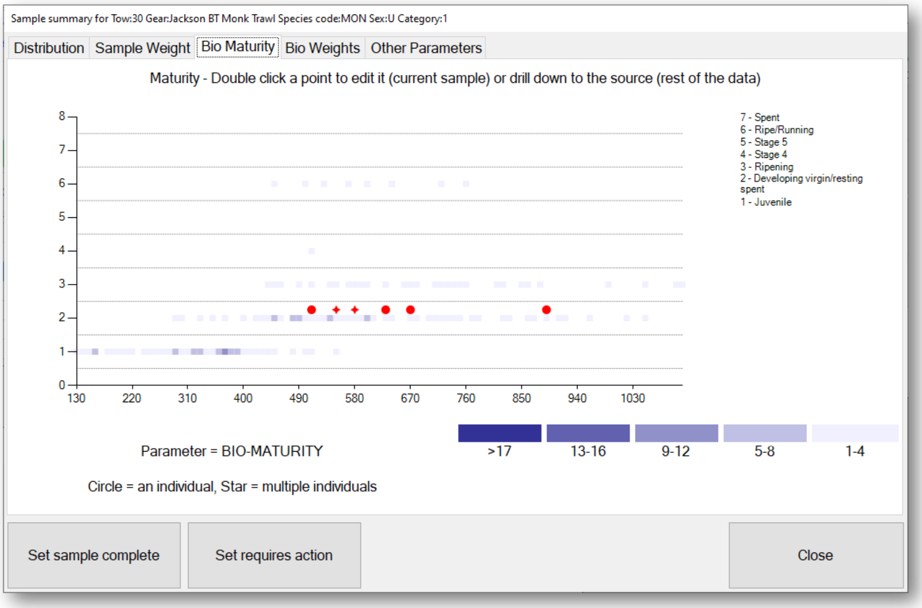

Figure 8.1.3.3. **Screen #3 Bio Maturity: shows the maturity entered for individual species (red circles for single data points, red stars for multiple points) versus the data for the survey for that species (bars using customizable colour scale).**

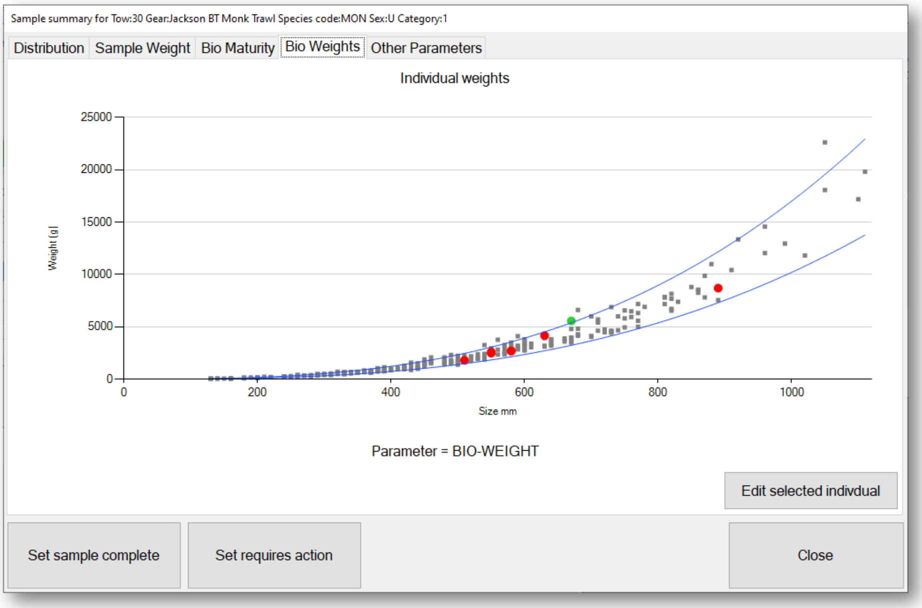

Figure 8.1.3.4. Screen #4 Bio Weights: shows the length versus weight for individual fish in the bio-sample for that haul (red circles). Overall survey data for that species is (grey). For species requiring biological samples and/or otoliths from individual fish, once this screen has been viewed the "Set Sample Complete" button is active and sampler can sign off on the sample and move straight to sample list for the next sample.

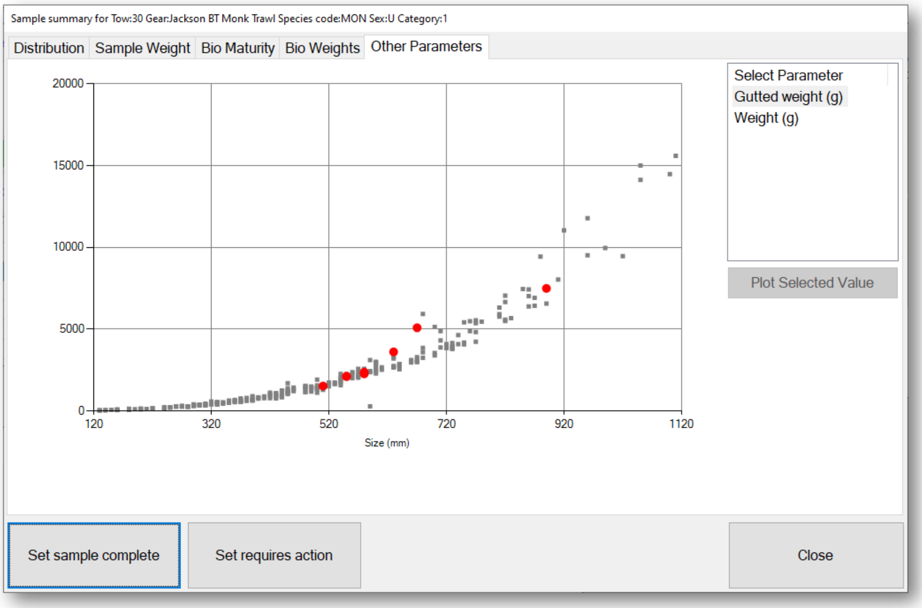

Figure 8.1.3.5. Screen #5 Other Parameters: is a final optional screen where you can plot any additional parameter(s) set up for that species against length to do a further visual check.

8.2 Modelling, using feeding preference and age-length data. (Presentation from Jasper Croll/Quinten Mudde)

Fish stocks do not live in isolation but interact with their environment. For accurate predictions of the dynamics of a fish stock, it is important to consider the impact of the environment on a stock. Especially the availability of resources in the environment might be of importance for the dynamics of a stock, because it limits the energy available for individual fish to grow and reproduce. We introduced a method to estimate the limitation of the environment from datasets with observed individual ages and sizes such as provided by the IBTS and BTS surveys. This method is based on a stochastic model of individual growth assuming that every individual follows a Von Bertalanffy growth curve in which the asymptotic size is determined by limitations from the environment. Variation in the environmental limitation leads to variation between years, variation between cohorts and variation between individuals within a cohort. Our method accounts for all three sources of variation to provide an estimate of the environmental limitation per period. In further research we will estimate the environmental limitation from survey data of various species and try to link this to environmental factors such as stock density, abiotic factors and limitations of other stocks.

While working with the NS-IBTS survey data from the ICES Datras database, we noted several remarkable patterns in the datasets. First, datasets of several stocks such as Mackerel and Cod contain entries of very small individuals at age 1 which do not match with most of the observations. Secondly, the Catch per Unit Effort (CPUE) per length per area recorded in the CPUE dataset and the Catch per number per hour in the SMALK data do not seem to match, although according to the data description both represent the number of individuals caught per hour per length (per area). We would like to know the difference between these quantities. Lastly, we are interested whether it is necessary to correct CPUE data for swept area.

8.3 eDNA approaches from EVHOE survey (presentation from C.Albouy done by P.Laffargue)

Tests are conducted on EVHOE to evaluate the use of eDNA. This is part of a strategy to provide proof of concept to develop new sampling methods for stock assessment but also to reduce the footprint generated by scientific observations. The ultimate goal is to define an operational design of a sampling protocol for use on existing fisheries surveys.

This approach implements 2 types of analysis which aim respectively at:

1. species detection and species richness assessment by metabarcoding
2. make a quantitative estimation of DNA to obtain proxies of abundance

The samplings carried out also make it possible to establish an eDNA (12S) reference database.

The results obtained (Evhoe 2019) showed that for 93% of the sampled stations, the eDNA analysis detected more genera than GOV trawling. eDNA method detected more pelagic species but also rare species (Figure 8.3.1). Analysis for quantitative estimation (Figure 8.3.2) showed a positive and significant correlation for the species tested (*e.g.* hake) but improvements, particularly in sampling techniques, should make it possible to confirm and improve these preliminary results.

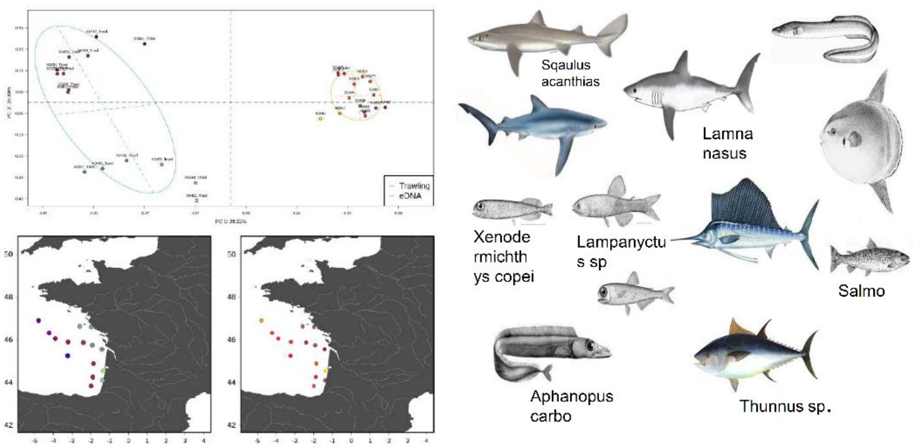

Figure 8.3.1. **Comparison of the species richness obtained by trawling and by eDNA analysis. A map of the stations used for the comparison is proposed as well as an illustration of species detected by eDNA that were not caught by trawl.**

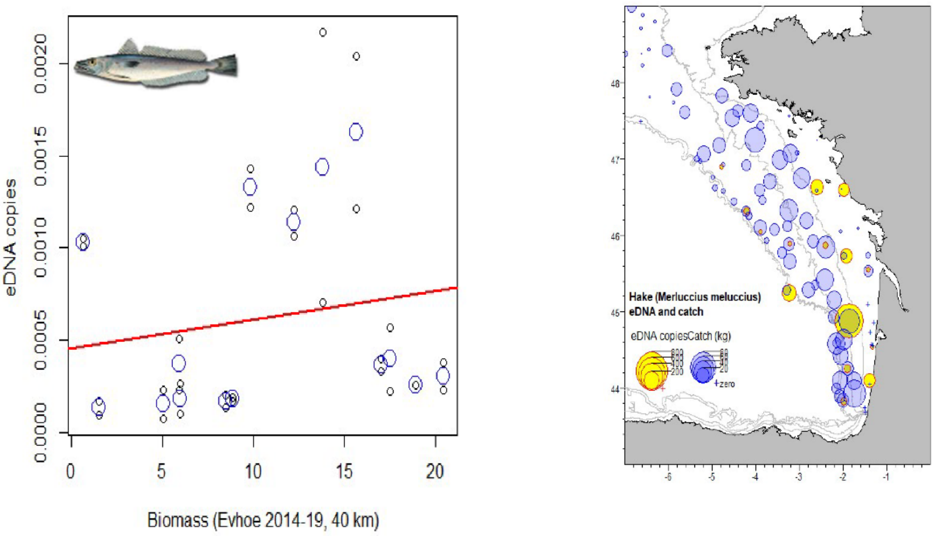

Figure 8.3.2. **Relationships and distribution maps of quantitative eDNA estimations ("eDNA copies") versus observed biomass during EVHOE.**

8.4 Functional distinctiveness in the NS (Talk by Arnaud Auber)

Presentation of the paper Murgier et al., 2021 (Murgier J., McLean M., Maire A., Mouillot D., Loiseau N., Munoz F., Violle C., Auber A., 2021 Rebound in functional distinctiveness following warming and reduced fishing in the North Sea. *Proceedings of the Royal Society B*. 288: 20201600)

Functionally distinct species (i.e., species with unique trait combinations in the community) can support important ecological roles and contribute disproportionately to ecosystem functioning. Yet, how functionally distinct species have responded to recent climate change and human exploitation has been widely overlooked. Here, using ecological traits and long-term fish data in the North Sea, we identified functionally distinct and functionally common species, and evaluated their spatial and temporal dynamics in relation to environmental variables and fishing pressure. Functionally distinct species were characterized by late sexual maturity, few, large offspring, and high parental care, many being sharks and skates that play critical roles in structuring food webs. Both functionally distinct and functionally common species increased in abundance as ocean temperatures warmed and fishing pressure decreased over the last three decades (Figure 8.4.1); however, functionally distinct species increased throughout the North Sea, but primarily in southern North Sea where fishing was historically most intense, indicating a rebound following fleet decommissioning and reduced harvesting. Yet, some of the most functionally distinct species are currently listed as threatened by the IUCN and considered highly vulnerable to fishing pressure (Figure 8.4.1). Alarmingly these species have not rebounded. This work highlights the relevance and potential of integrating functional distinctiveness into ecosystem management and conservation prioritization.

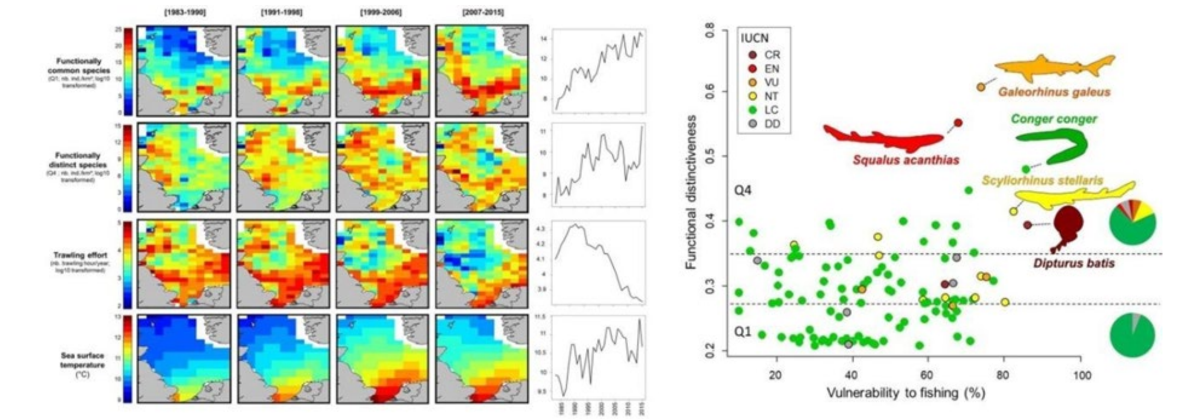

Figure 8.4.1. left panel: Temporal trends in the abundance of functionally common and functionally distinct species (log-transformed number of individuals per km2), trawling effort (log-transformed trawling hours per year) and sea surface temperature (SST; in °C). The overall trends over the study period (1983–2015) are shown on the right panels. The maps present the average values of the variables calculated on sub-periods (1983–1990; 1991–1998; 1999–2006, 2007–2015) for the 154 ICES Rectangles. right panel: Relationship between species' vulnerability to fishing and functional distinctiveness. IUCN status is represented by colours (CR = critically endangered, dark red; EN = endangered, red; VU = vulnerable, orange; NT = near-threatened, yellow; LC = low concern, green; DD = data deficient, grey). The horizontal dotted lines indicate the delineation of the two groups of functional distinctiveness (Q1 = Quartile 1, functionally common species; Q4 = Quartile 4, functionally distinct species). The two pie charts show the proportion of species belonging to each IUCN category in the two groups of functional distinctiveness.

8.5 Presentation of the MAESTRO project (cliMate chAnge EffectS on exploiTed maRine cOmmunities) - Talk by Arnaud Auber

The oceans account for more than 60% of monetized ecosystem services. Among these services, humankind critically depends on marine resources such as fish and benthic invertebrates for food and economic security. With ongoing fishing pressure and climate change strongly affecting the distribution and abundance of species at the global scale, our dependence on ocean ecosystem services urges us to better anticipate the future of marine resources and propose adaptive mitigation strategies. While numerous projections of future species distributions have been produced, the expected alterations of trait structure within communities (i.e., the functional characteristics of species) have received far less attention. More precisely, we lack integrated models and scenarios to better predict and anticipate the mixed impacts of climate change and fishing pressure on the types of diversity in marine communities that ultimately determine their functioning. By taking advantage of available data on long-term fish and invertebrate surveys, species traits, fisheries and the environment, the main goals of the MAESTRO project are thus 1) to characterize and assess the effects of climate and fishing on the functional diversity of exploited communities during the last three decades in the Northeast Atlantic and Mediterranean Sea, 2) to forecast how exploited communities will respond to the upcoming warming until the end of this century, and 3) to investigate, for several climate change scenarios, alternative harvesting strategies targeting different species and trait groups in order to minimize the impacts of fishing on functional diversity.

8.6 NS haddock Condition and Parasites (presentation by Ralf van Hal)

In the IBTSWG 2020 report (ICES, 2020) some remarks were made related to the low condition of a part of the haddock in the North Sea quarter 1 survey. As a follow up of these remarks and quick analysis of the Fultons condition based on the information in the CA-records of the 2020 survey, it was proposed to collect additional data on this during the 2021 survey.

During the 2021 Q1 NS-IBTS additional data on length and individual weight of haddock was collected. It was proposed to collect this information of all the haddock, that according to the manual, should be measured for length. This proposal was followed by some countries while some others had problems organizing this as their electronic measuring system wasn't able to store this type of data or the workload on board was already too much to add these additional measurements consistently. Despite these issues, also these countries were able to collect some additional data.

Next to the length/weight data it was proposed to collect information on the presence of dwarf growth and the presence (and counts) of the females of the copepod parasite *Lernaeocera branchialis* present in the gills. The females attach to the gills and the oral end penetrates the body until it enters the rear bulb of the haddocks heart. There, firmly rooted in the circulatory system, the front part of the parasite develops in the shape of antlers or branches on a tree, reaching into the main artery. In this way, while safely tucked beneath the gill cover, the parasite can feed on blood while eggs develop and are released into the water column.

Prior to the IBTSWG meeting the data on this of the Netherlands, Germany, Norway and Denmark was available. Scotland has collected data, but wasn't able to get it in a proper format to share prior to the meeting. Counts of parasites were available for Germany and the Netherlands, Norway mentioned they have counts as well, however only provided presence at this time. Only a part of this additional data is submitted to Datras (all the Dutch length/weight data), the rest is available as separate files. Based on the available data some preliminary analyses have been done, to present these to the IBTSWG.

Looking at the data available in the 2021 CA-data, indicates a similar spatial pattern in mean Fultons condition factor as in previous years (ICES, 2020). With better conditions in the north and northeastern part of the survey and low to bad conditions in the south, southwestern part (Figure 8.6.1). Using only the additional data gives a slightly different image with lower conditions in a larger part of the area (Figure 8.6.1, 8.6.2). This could be an indication that a larger sample is required to properly assess the condition, and that some bias might exist in the selection of fish for the otoliths, at least for some of the countries. However, there is also the influence of the amount of data available by haul, which is low in the most southern areas where only a single fish was caught. While much larger amounts per haul were collected in other areas, depending on the effort a country was able to place in collection these additional data. There is also the influence of the size of the individual haddock, with larger size having on average a better condition. While on the smaller size the influence of measuring on cm/mm (DK+GE on cm/ NL+NO on mm) and the ability to properly measure low weights on board might have a larger impact.

The additional data available consisted of 12,684 haddock measured, weighed and the dwarf growth and parasites determined. Of these only 31 were classified as having dwarf growth, being ~0.2%.

Parasites were found in 1385 fish, which accounts for ~11%. The presence of parasites was in many cases already visible based upon the appearance of the haddock. The haddock on the left side were almost certainly having parasite while the ones on the right side were less likely to have parasites (Figure 8.6.3). This state of emaciation visible to the eye is also reported for whiting infected by the same parasite (Henderson, 2019). Based on the counts of the parasites it is clear that the majority of infected haddock has only a single parasite, however up to 9 parasites in an individual haddock were counted.

The occurrence of parasites was not evenly distributed over the hauls, there were clear aggregation with higher and lower prevalence of the parasites, with a single station have even 60% of the haddock infected with the parasite (Figure 8.6.5). Surprisingly, stations with no parasites presence were mainly found in southwestern part. This might be related to the low numbers present and thus sampled in these stations. A further investigation of this is required, preferably when the additional Scottish data becomes available. Also, further analysis is required on the impact of the parasites on the condition, which was visible with the eye, but not straightforward from a simple boxplot comparing the presence/absence versus the condition (Figure 8.6.4). However, in an improved analysis at least the impact of length needs to be considered.

A first literature search on the condition and occurs of parasites in haddock provides limited information. For haddock a paper by Hislop and Shanks (1981) indicated that haddock infected had a significant lower condition than fish that were uninfected. They also showed that infected haddock had 21% lower fecundity than uninfected fish. Other papers report the impact of *Lernaeocera branchialis* on cod (Jones and Taggart, 1998; Khan 1988; Scholz, 1999) or whiting (Van de Broek 1978; Potter et al. 1988, Henderson 2019) all indicating a lower condition, and some indicating a lower survival. Khan (1988) indicates peak mortality of 30% within 4 months after infection, with the highest mortality in young fish. While also the recovery of (larger) individuals is reported as after some time the copepod releases.

The bad condition of haddock was noticed last year by a long-term participant on the IBTS. This might suggest a change in the pattern or and overall poor condition. However, looking back into the recent years indicated that this lower condition and the spatial pattern existed at least some time before and based on the recent data is persistent. However, the low condition and possibly survival might have an impact on the predictability of the stock while not incorporated in the assessment, especially when a bias in CA-records exists. The presence of the parasite is already reported many years before, however there is little knowledge on it is development and spread in the North Sea, which is likely also dependent on its secondary host flounder. A change in the appearance of the parasite might impact the condition, the fecundity and the mortality. As the impact on mortality seems highest at juvenile haddock it might impact the recruitment indices when the occurrence of these parasites increases. A significant part of the juvenile haddock is in a state of emaciation and of these a large part occurs in such a state that based on their appearance survival is unlikely.

The registration of the presence of *Lernaeocera branchialis* relatively simple and doesn't take much time when it is done on the fish for which already otoliths are taken. Therefore, it is decided to continue the registration for at least these fish and when possible, extend this registration also to other species as whiting, cod and bib. The registration of additional weight information is much more time consuming as it requires on board of most vessels a change in the routine. This will be further discussed to see how this can be incorporated getting the best data within reasonable additional time.

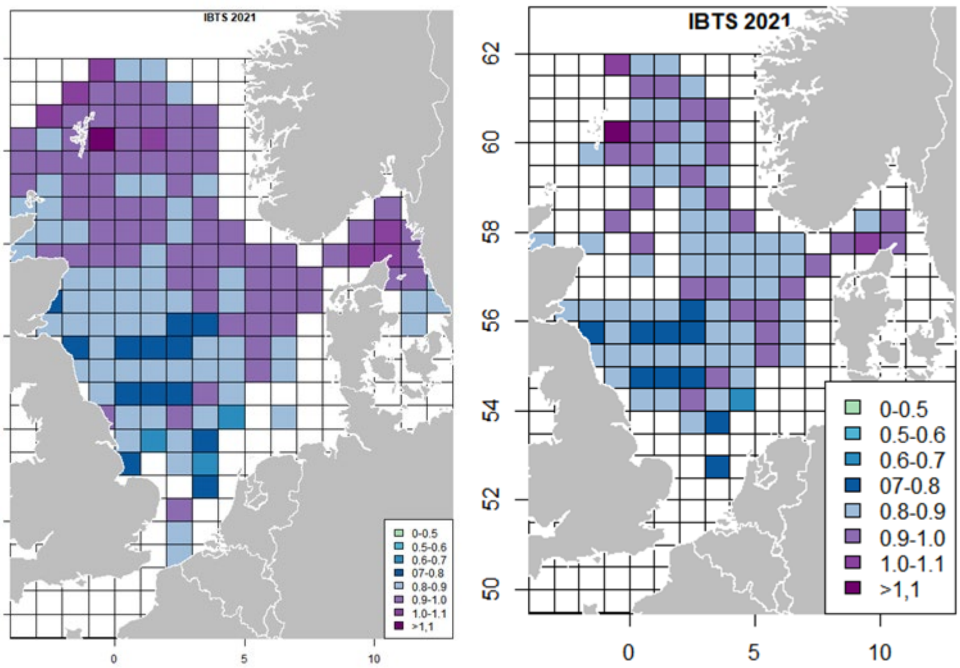

Figure 8.6.1. **left is the average condition by rectangle based on the data in the CA-record available via Datras; Right is the average condition by rectangle based on the additional data provided by NL, DK, NO, GE.**

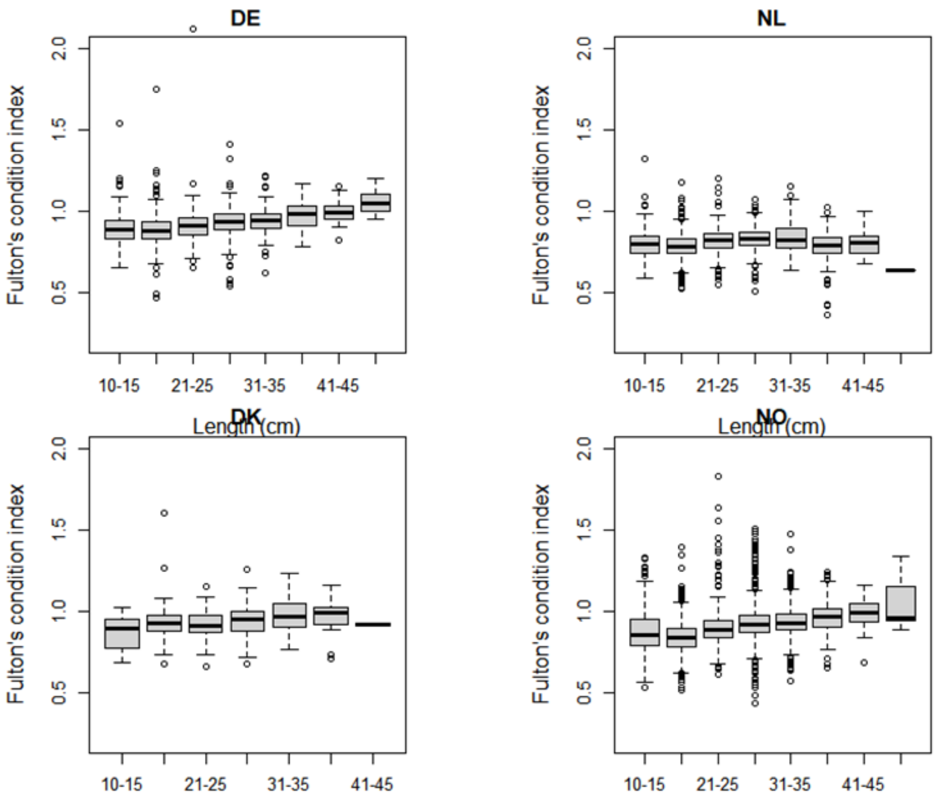

Figure 8.6.2. The condition by 5 cm length class by country based on the additional data provided. With Norway and Germany (DE) sampling further north where the majority of large haddock occurs.

Figure 8.6.3. **Photo taken during the Dutch survey of on the left haddock almost certainly having parasites, while on the right haddock less likely to have parasites.**

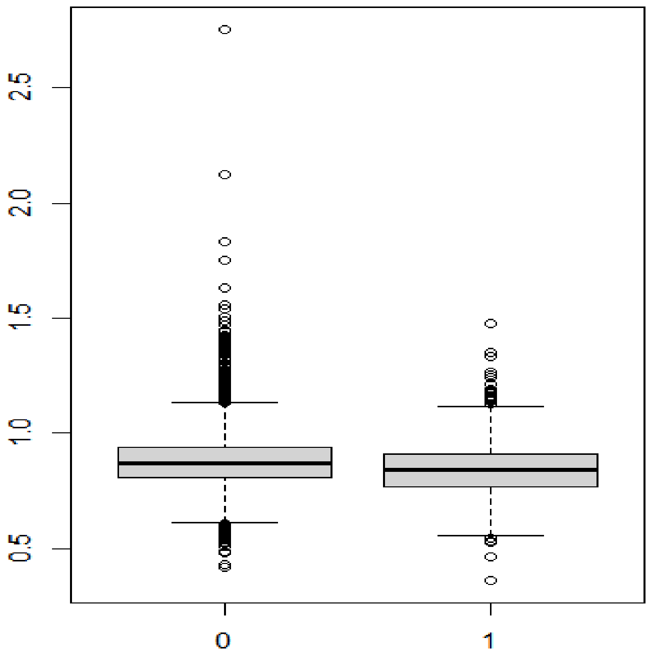

Figure 8.6.4. **x-axis is absence (0) and presence (1) of parasites and with on the y-axis the Fulton condition.**

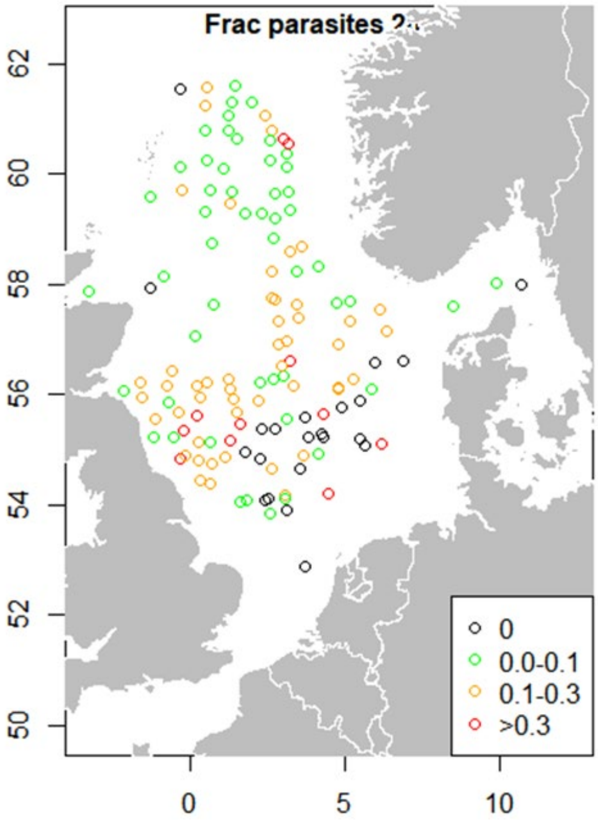

Figure 8.6.5. **fraction of the measured haddock having parasites.**

Annex 1: List of participants

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Annex 2: Resolutions

2018/MA2/EOSG03 **The International Bottom Trawl Survey Working Group** (IBTSWG), co-chaired by Ralf van Hal*, Netherlands, and Pascal Laffargue*, France, will meet to work on ToRs and generate deliverables as listed in the Table below:

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2019	1–5 April	Den Helder, NL	Interim report by 20 May 2019 to EOSG	
Year 2020	30 March 2April	Webex	Interim report by 1 May 2020 to EOSG	
Year 2021	12-16 April	Online	Final report by 14 May 2021 to EOSG	

ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected deliverables
a	Coordination and reporting of North Sea and Northeastern Atlantic surveys, including appropriate field sampling in accordance with the EU Data Collection Framework. Review IBTS SISP manuals in order to achieve additional updates and improvements in survey design and standardization. (ACOM)	Intersessional planning of Q1; Q3 and Q4 surveys; communication of coordinator with cruise leaders; combing the results of individual nations into an overall survey summary. Intersessional activity, ongoing in order to improve survey and manuals quality.	3.1, 3.2	Recurrent annual update	1) Survey summary including collected data and description of alterations to the plan, to relevant assessment WGs and other EGs (WGCSE, WGNSSK, HAWG, WGHMM;,WGDEEP, WGWIDE, WGEEL, WGCEPH, WGML) and SCICOM. 2) Indices for the relevant species to assessment WGs (see above) 3) Planning of the upcoming surveys for the survey coordinators and cruise leaders 4) Updated version of survey manual, whenever substantial changes are made.
b	Address DATRAS-related topics in cooperation with DGG: data quality checks and the progress in re-uploading corrected datasets, quality checks of indices	Issues with data handling, data requests or challenges with re-uploading of historical or corrected data to DATRAS have been	2.1, 3.1	Multi-annual activity.	Prioritized list of issues and suggestion for solutions and for quality checking routines, as well as definition of possible

	calculated, and prioritizing further developments in DATRAS. (ACOM)	identified and solutions are being developed			new DATRAS products, submitted to DATRAS group at ICES. Annual check of recent survey data.
c	Develop a new survey trawl gear package to replace the existing standard survey trawl GOV. (SCICOM)	The divergence in the GOV specification from the one given in the survey manual due to historical drift and technical creep has been acknowledged by the group (WGIBTS 2015). Furthermore, the deviation from the specification contained in the manual and between users has widened to the point where it will never be reversed. Therefore, the preferred option is to maintain the status quo of national GOV specifications and develop a new survey trawl package to replace the GOV. A number of IBTS members are due to replace vessels in the next few years and this provides an opportunity to review time-series and undertake inter-calibration trials between the GOV and a new trawl. A further driver for a new gear has been highlighted by the Celtic Sea area where the necessity to optimize sampling opportunities is not been provided by the GOV. In parallel with trawl development the process of replacing the GOV will need to be defined with reference to continuing the assessments and existing time-series. (For this ToR, the IBTS WG seeks support from gear technology experts and welcomes their advice and input into the development of the new survey gear package)	3.1, 3.2	2 years	Design specification (Working document) in 2020
d	Evaluate the current survey design and explore modifications or alternative survey designs, identifying any potential benefits and	Specific issues to be addressed include:	3.2	1 - 3 years	CRR on effect of tow duration on catch rates and species

	drawbacks with respect to spatial distribution and frequency of sampling, survey effort in terms of number of otoliths by species and number of trawl hauls. (SCI-OCM)	Stratification and optimal spatial distribution of effort.		richness by end of 2019 Paper on variance estimation of abundance indices in 2020 Paper on Stratification and distribution of survey effort in 2021.

Summary of the Work plan

Year 1	**Organise a workshop bringing together gear technologist and survey scientists to discuss gear options in relation to data needs and implementation issues**
Year 2	Evaluate proposed gear options and their effect on timeseries
Year 3.	Carry out at sea trials and evaluate results
Recurrent annual activity	Updates for ToRs a, b, and c.

Supporting information

Priority	**Essential, the general need for monitoring fish abundance using surveys is evident in relation to fish stock assessments, and it has increasing importance in relation to MSFD GES descriptors biodiversity, foodwebs, and bottom integrity. Besides the relation of fish abundance with descriptor 3 Exploited stocks.**
Scientific justification	ToR a) This is a core function of the IBTSWG, an important forum for coordination and evaluation of standardized bottom trawl surveys in the Eastern Atlantic Area, to ensure good survey coverage in relation to stocks and areas. inter-calibration work. and high quality of data. The group also provides a brief overview the result of the individual surveys undertaken during the previous year and in the first quarter of the ongoing year. IBTSWG will continue to review feedback and implement modifications, including coordination and implementing new requirements of the EU DCF. To ensure quality and traceability of sampling protocols, changes in the design and procedures used in the surveys coordinated by the IBTSWG have to be implemented and documented in detail in the IBTS manuals, which are available via the ICES webpage under Series of ICES Surveys Protocols. ToR b) DATRAS has become the core database containing the data obtained in the national IBTSurveys, the development of DATRAS needs to be evaluated annually, and the group is also one of the forums to discuss with ICES Data Centre and agree on the priority of desired further developments. ToR c) A number of IBTS members is due to replace vessels in the next few years and this provides an opportunity to review time-series and undertake inter-calibration trials between the GOV and a new trawl. ToR d) Efficiency and effectiveness are important drivers in the implementation of high-cost surveys. Evaluations of different implementation options and their consequences need to be reviewed at regular intervals, particularly as changes to the gear are being discussed at present.
Resource requirements	A 5-day IBTS meeting. Prepared documents from members following ToR Leaders identified above. 8-day Chair's time to edit. It is estimated that each ToR will require at least 8 hours of preparation.
Participants	The Group is normally attended by some 20–25 members and guests. All members will participate on the discussion of all ToRs, but ToRs leaders have been identified and appointed to intersessionally prepare the work and lead it in the meeting.
Secretariat facilities	SharePoint plus normal secretariat support.

Financial	No financial implications.
Linkages to advisory committees	ACOM. IBTS indices are used in the assessment of multiple stocks.
Linkages to other committees or groups	There are relations with other bottom-trawl surveys (WGBEAM, WGBIFS) that also use DATRAS as the international repository for its data (WGDIM, DGG). There are also linkages with Assessment WGs using IBTS indices. Also relevant to the Working Group on Ecosystem Effects of Fishing Activities (WGECO), the Working Group on Improving use of Survey Data for Assessment and Advice (WGISDAA) and Working Group on Integrating Surveys for the Ecosystem Approach (WGISUR).
Linkages to other organizations	IOC, GOOS, OSPAR, Regional Coordination groups (DCF).

Annex 3: North Sea Q1 2021

(Coordinator: Ralf van Hal)

1.1.1. General overview

The North Sea IBTS Q1 survey aims to collect data on the distribution, relative abundance and biological information on a range of fish species in ICES Division 3.a, Subarea 4 and the eastern part of Division 7.d. During daytime a bottom trawl, the GOV (Grand Ouverture Verticale), with groundgear A or B, was used. A CTD was deployed at most trawl stations to collect temperature and salinity profiles. During night-time herring larvae were sampled with a MIK-net (midwater ring net). Age data were collected for the target species cod, haddock, whiting, saithe, Norway pout, herring, mackerel, and sprat, and several additional species.

The quarter 1 2021 fleet consisted of seven vessels: "Dana" (26D4, Denmark), "GO Sars" (58G2, Norway), "Scotia" (748S, Scotland), "Thalassa" (35HT, France), "Walther Herwig III" (06NI, Germany), "Tridens II" (64T2, Netherlands) and "Svea" (77SE, Sweden). The survey covered the period 19 January to 24 February 2021(Tab. A3.1).

A total of 384 GOV hauls (10 of which were invalid) (Tab. A3.2) were uploaded to DATRAS and 683 valid MIK hauls (Tab. A3.3) were deployed. Larvae data for herring and other fish species (chiefly sardine and lemon sole) were uploaded to the ICES fish eggs and larvae database. All ICES-rectangles were covered by at least one GOV haul (Fig. A3.1) and at least two MIK hauls. One of the Norwegian hauls was deployed in 44F6, on the edge of the shelf (proximity to the Norwegian Trench) close to roundfish area 7.

Biological data (weight, gender and maturity and age material) are collected from several species (Tab. A3.4). An impression of the catches is given in figure A3.2, by presenting the total fish catch in kilograms. Gear geometry plots are given in Figures 5.1.1.3a to 5.1.1.3d (lines represent theoretical values for the GOV from flume tank experiments, ICES 2015).

A large part of the 2021, Q1 IBTS was executed with in the January part mainly westerly winds varying from northwest to southwest, while the February part was dominated by easterly/north-easterly winds. In the period of these easterly winds there was a front in the middle of the North Sea, at the height of the UK/Scotland border with heavy winds, while north and south of this front it was calm weather and as a result most countries could easily cover their part of survey.

As a result of the mild weather conditions most countries were able to cover their own rectangles. Only in the frontal area some rectangles were swapped between Denmark and the Netherlands. However, due to receiving the UK-permit extremely late, nearly at the end of the survey, France covered some Dutch stations outside UK-waters and were unable to cover all of their own stations in UK-waters. These were later covered by the Netherlands.

Denmark was not able to fish in 38F1 and 38F2 as they did not receive dispensation for bottom trawling in UK Marine Protected Areas, they were able to do the plankton sampling. Due to rough weather, Denmark had to reduce the plankton sampling in rectangles 44F4, 43F4 and 42F4. Most of these have been covered by other countries.

Remarks:

Vertical net opening in the German hauls of Q1 2021 was higher than in previous years, and in many cases outside the recommended range (FigureA3.3b). The same was true for Q3 2020.

The reason for this different performance could not yet be uncovered; the chief scientists are not aware of any principal changes in the rigging or net handling, which might have affected the vertical net opening. Preliminary analyses have been conducted, which showed a similar behaviour in a few earlier survey events (e.g., 2019 Q3 and 2018 Q1, but not intermediately during 2018 Q3). A more thorough analysis will be performed, exploring possible reasons for deviation in the measured vertical net opening. The results will be presented and discussed within the IBTSWG.

Maturity data were uploaded in the A-E format by Denmark, France, and the Netherlands, while being uploaded in the 61-66 format by the other countries. These formats are currently available in the datras exchange data. The ICES data centre has told during the IBTSWG meeting that they will convert these data to a single format. So countries are allowed to adjust their own upload, but it is not necessary as it will be levelled by the conversion of the data centre.

Table A3.1 - Overview of the surveys performed during the North Sea IBTS Q1 survey in 2021. In grey fishing activity, in purple no fishing due to storm, in red no fishing due to mechanical issues.

										January															February																							
country	Vessel	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Sweden	Svea										0	3	3	4	4	4	3	2	2	3	3	4	4	4	3	3	3	0																				
France	Thalassa II											3	3	3	2	3	3	2	3	3	3	2	3	3	3	3	2	2	3	2	1																	
Norway	GO Sars								0	0	1	2	2	3	3	3	2	3	3	2		3	3	3			2	3	3	3	3	1																
Germany	Walther Herwig																	0	4	5	3	4	5	4	4	4	4	4	1	4	4	4	4	4	2	1	2	0										
Scotland	Scotia III														2	4	4	3	4	4	3	3	3	4	3	4	4		1	3	3	4	4	1	0													
Denmark	Dana					active fishing																			2	3	4	3	3	3	2	2	3	3	3	3	2	2	3	3	1	0						
Netherlands	Tridens 2					due to weather no activities											0	3	3	4	0			1	4	3	4	0			0	3	4	5	4	1	0	4	4	4	0				1	4	3	0

Table A3.2 - Overview of the GOV stations fish in the North Sea IBTS Q1 survey in 2021.

ICES Divisions	Country	Gear	Tows planned	Valid	Invalid	% stations fished
3.a	SWE	GOV-A	40	45		113%
	DEN	GOV-A	4	4		100%
	NOR	GOV-A	3	3		100%
4.a-c	GFR	GOV-A	67	67		100%
	SWE	GOV-A	7	7		100%
	NOR	GOV-A	41	41		100%
	FRA	GOV-A	43	43	3	100%
	DEN	GOV-A	41	39	2	95%

	NED	GOV-A	57	58	1	102%
	SCO	GOV-A	11	12	1	109%
	SCO	GOV-B	46	45	3	98%
7.d	FRA	GOV-A	10	9	1	90%
44F6 (4.a, outside roundfish areas)	NOR	GOV-A	1	1		100%

Table A3.3 - Overview of the MIK stations fish in the North Sea IBTS Q1 survey in 2021.

ICES Divisions	Country	Gear	Tows planned	Valid	% stations fished
3a	SWE	MIK	41	41	100%
	DEN	MIK	8	8	100%
	NOR	MIK	6	6	100%
4	GFR	MIK	134	144	107%
	SWE	MIK	14	14	100%
	NOR	MIK	84	84	100%
	FRA	MIK	86	87	101%
	DEN	MIK	84	84	100%
	NED	MIK	114	90	79%
	SCO	MIK	116	90	78%
7d	FRA	MIK	20	25	125%

Table A3.4 - Overview of individual length, weight and/or maturity and/or age samples collected during the North Sea IBTS Q1 survey in 2021.

Species	DE	DK	FR	GB-SCT	NL	NO	SE	Total
Melanogrammus aeglefinus	889	407	63	1221	3461	6390	417	12848
Merlangius merlangus	846	693	776	717	643	926	954	5555
Clupea harengus	788	677	451	501	676	627	1652	5372
Sprattus sprattus	331	368	424	318	426	5	954	2826
Pleuronectes platessa	143	409	562	116	367	27	433	2057

Trisopterus esmarkii	292	118		387	103	588	252	1740
Gadus morhua	229	164	50	415	135	344	392	1729
Scomber scombrus	227	31		295	70	237	34	894
Micromesistius poutassou	22					689		711
Eutrigla gurnardus	400	201						601
Pollachius virens	69	14	2	24	10	229	47	395
Limanda limanda		370						370
Trachurus trachurus						346		346
Microstomus kitt	147	108		83				338
Merluccius merluccius	46	1		74	7		66	194
Engraulis encrasicolus	46					91		137
Solea solea			98				22	120
Trisopterus luscus			109					109
Mullus surmuletus			105					105
Raja montagui	4			74	2			80
Glyptocephalus cynoglossus		15					56	71
Mustelus spp.	26			30	3	4		63
Leucoraja naevus	7			48	2	3		60
Scyliorhinus canicula	29				13	10		52
Squalus acanthias	44							44
Lophius piscatorius	13			28				41
Sardina pilchardus	30					10		40
Amblyraja radiata	8			13				21
Scophthalmus maximus	2		13		4			19
Dipturus batis				19				19
Dicentrarchus labrax			16					16
Chelidonichthys cuculus			14					14
Scophthalmus rhombus	4		1		3			8
Lophius budegassa				8				8
Chimaera monstrosa						4		4
Raja clavata				3				3
Etmopterus spinax						2		2
Dipturus oxyrinchus						1		1
Pollachius pollachius					1			1

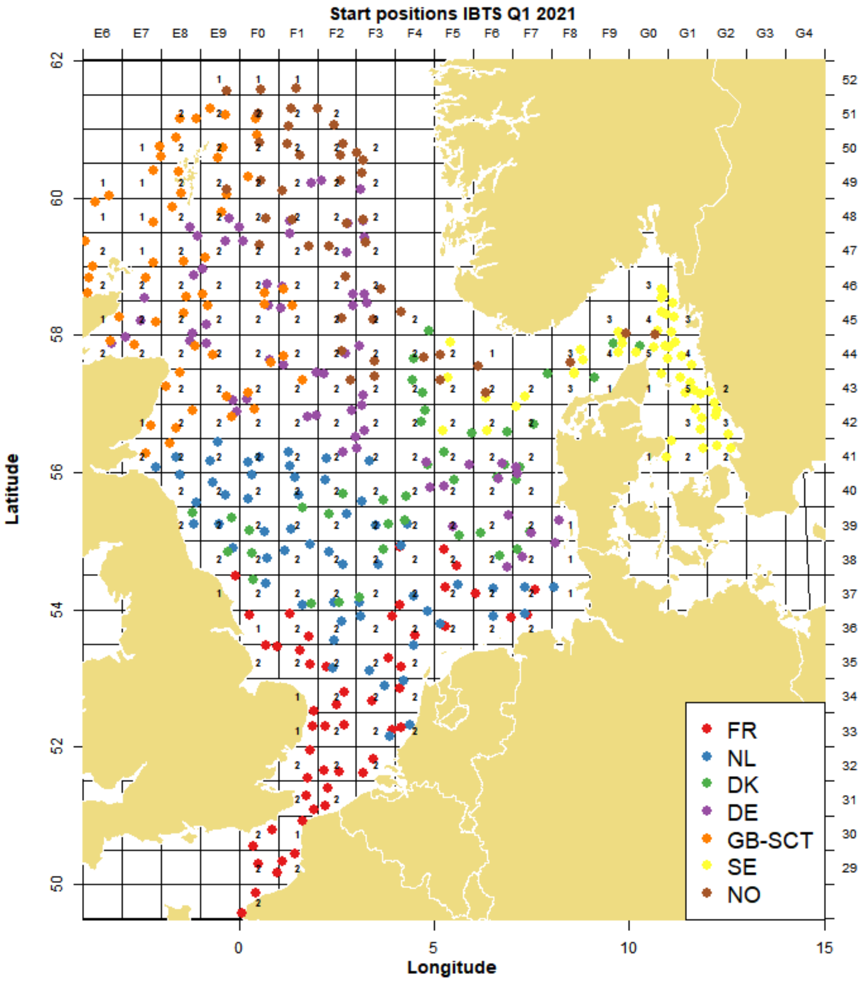


Figure A3.1 - Number of hauls per ICES rectangle with GOV during the North Sea IBTS Q1 2021 and the start positions of the trawls by country.

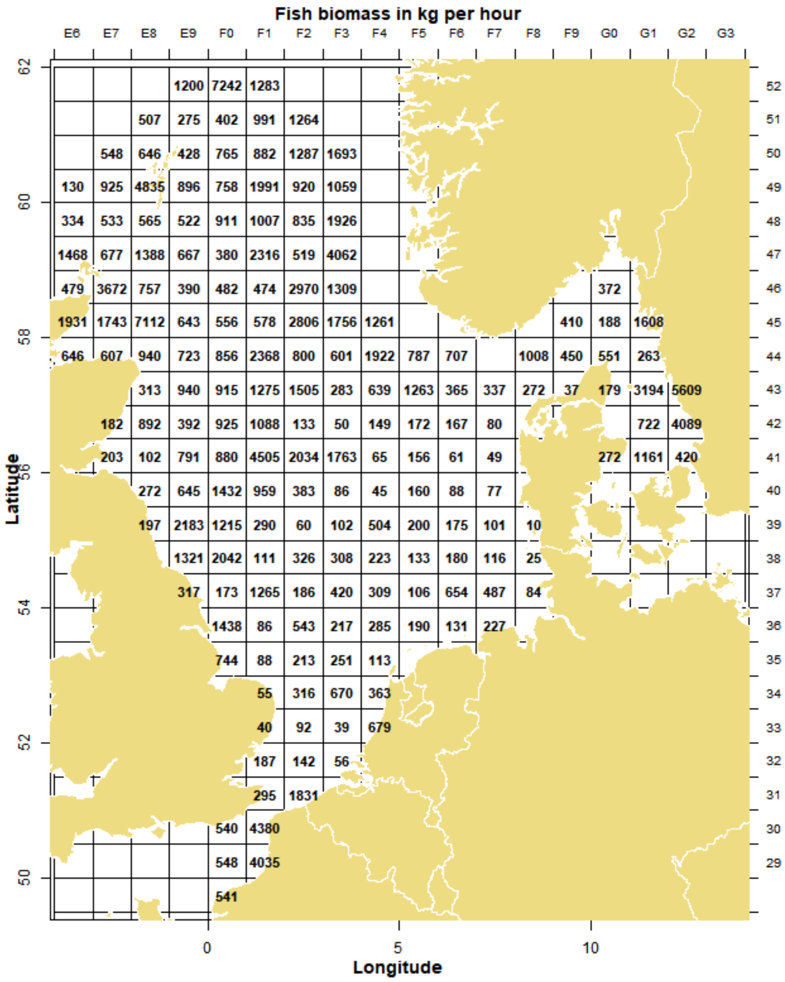


Figure A3.2 - Distribution of fish biomass in IBTS hauls by rectangle in the North Sea, Q1 2021 (values standardized to kg per hour haul duration; mean per rectangle).

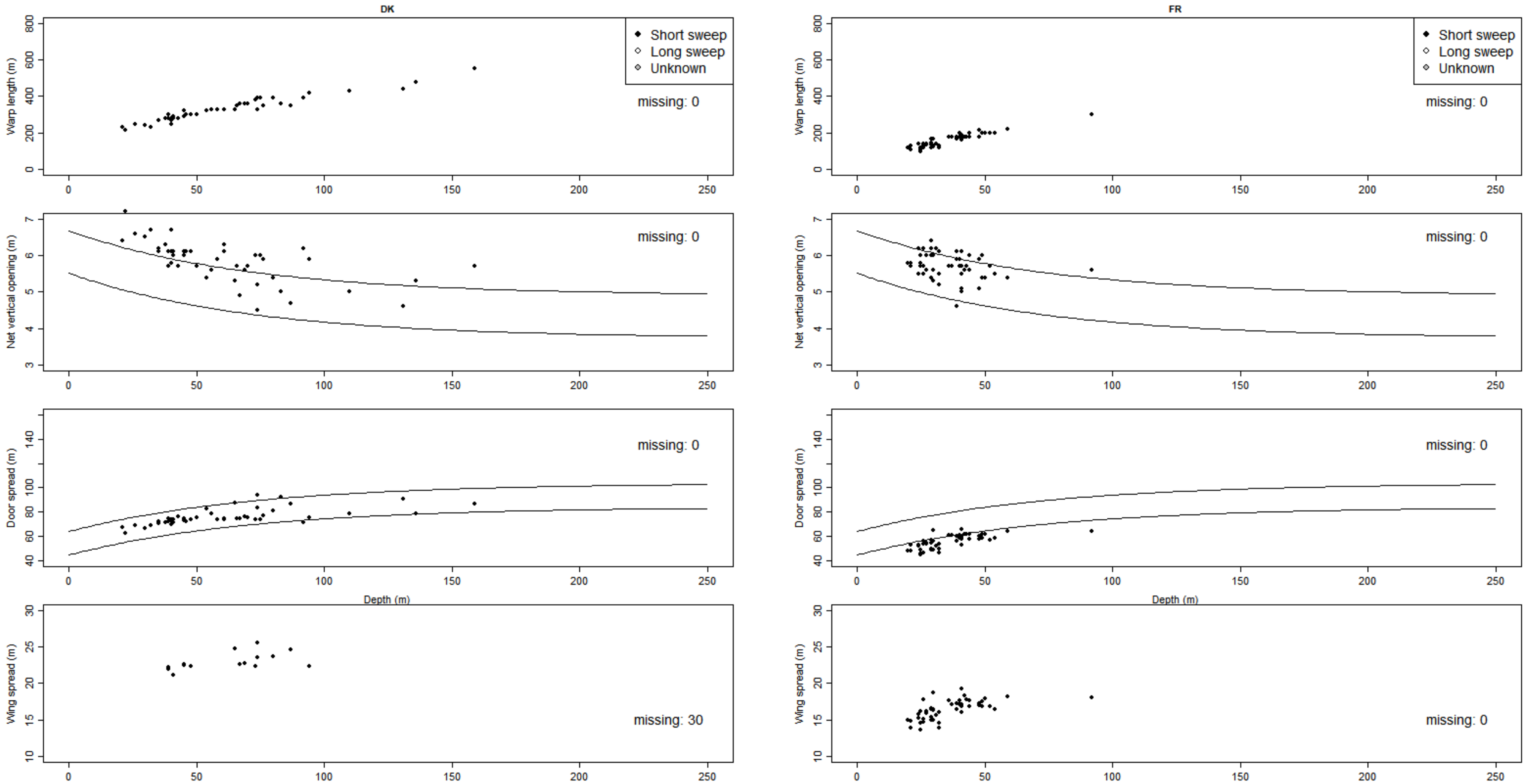


Figure A3.3a - Danish and French warp length and gear geometry

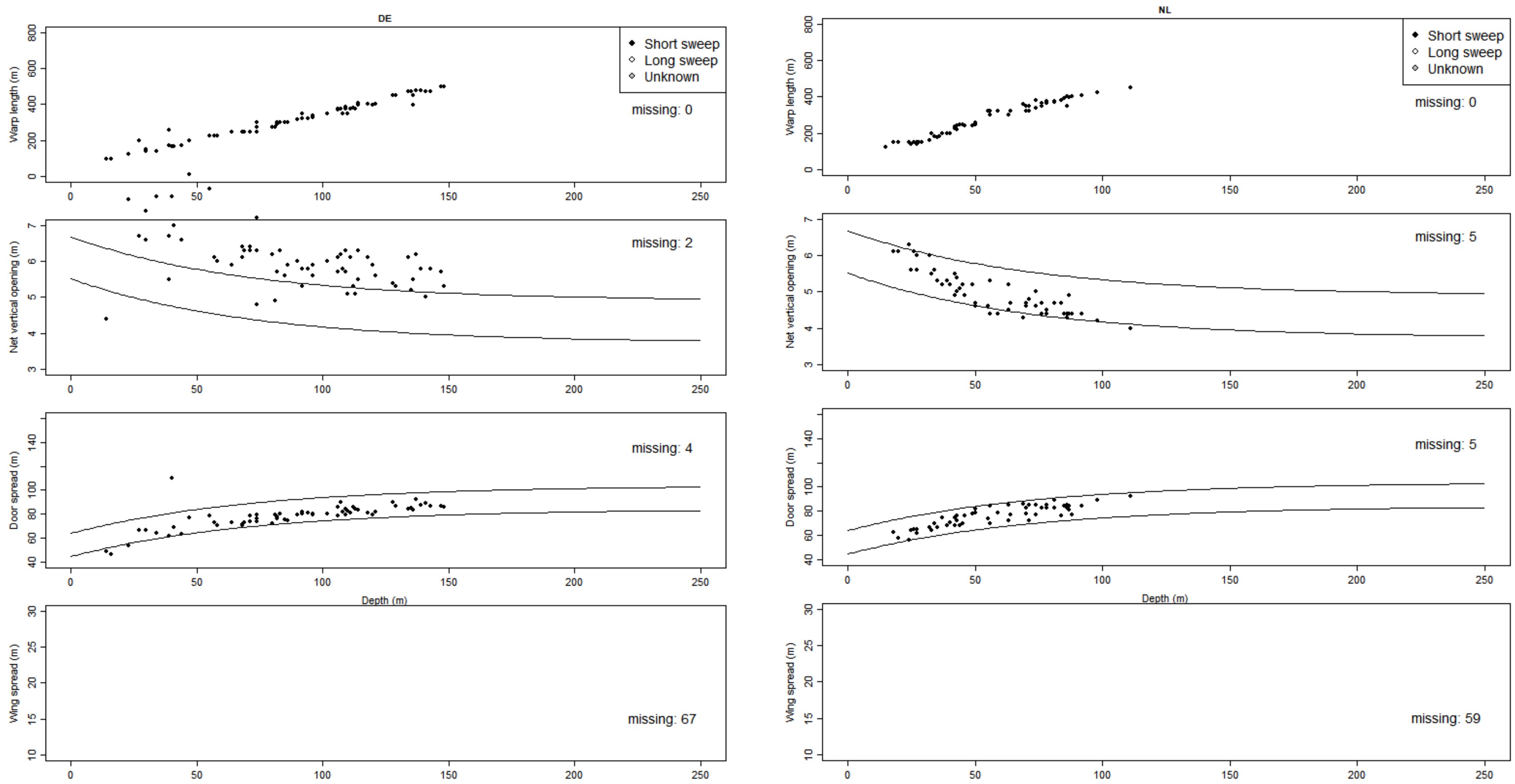


Figure A3.3b - German and Dutch warp length and gear geometry.

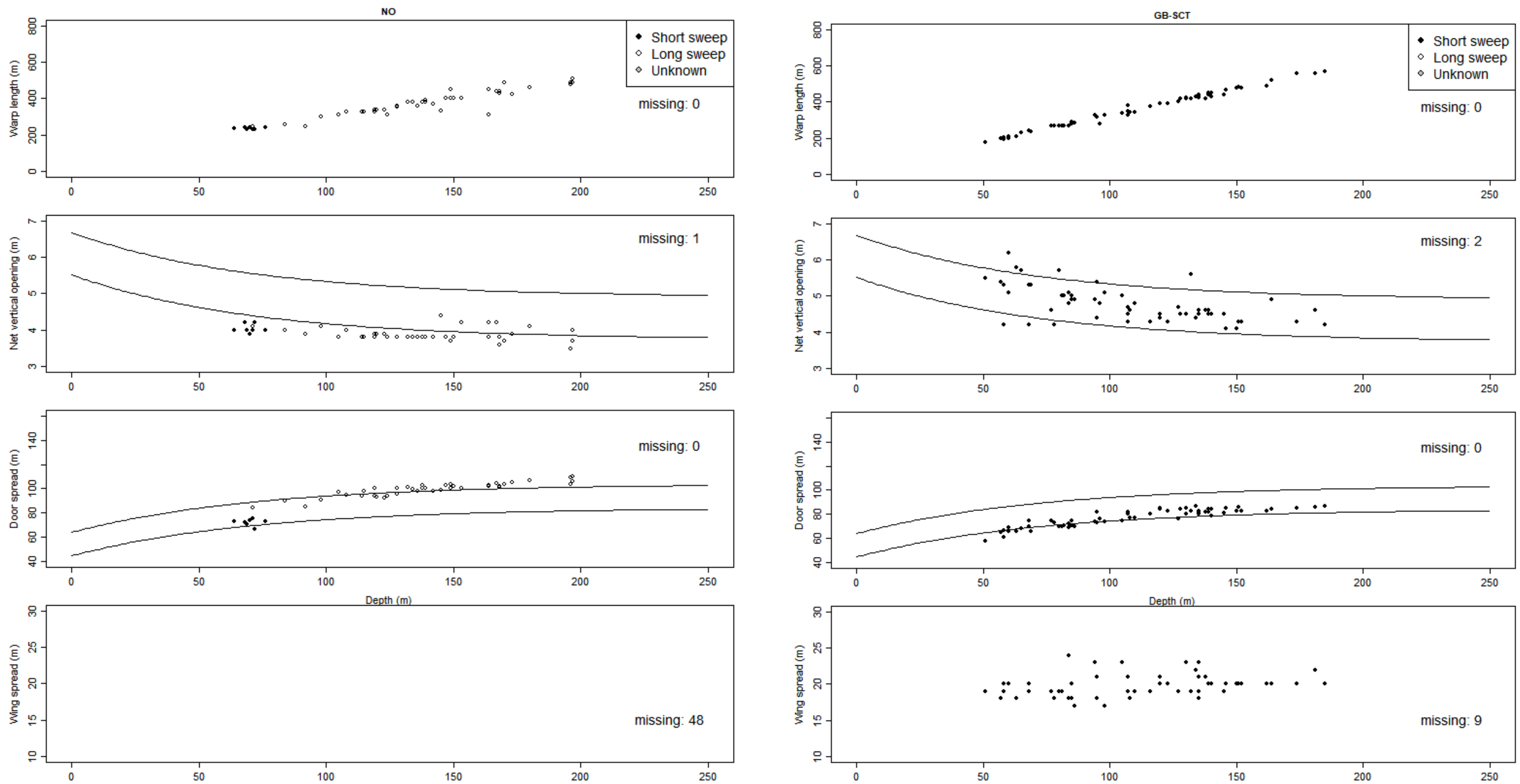


Figure A3.3c - Norwegian and Scottish warp length and gear geometry.

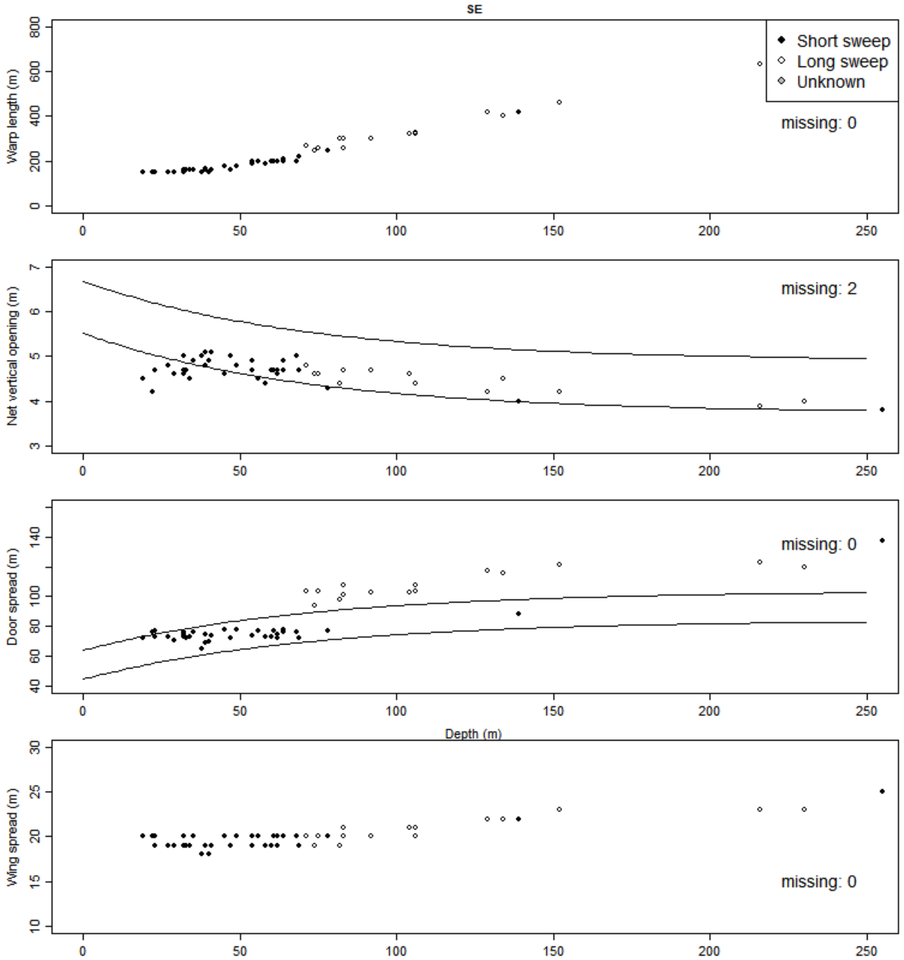


Figure A3.3d - Swedish warp length and gear geometry, the deepest haul was done long sweeps but needs to be corrected in Datras.

Issues and problems encountered

No issues encountered in 2021, other than the UK-permit issue touched-upon elsewhere in the report.

Additional activities

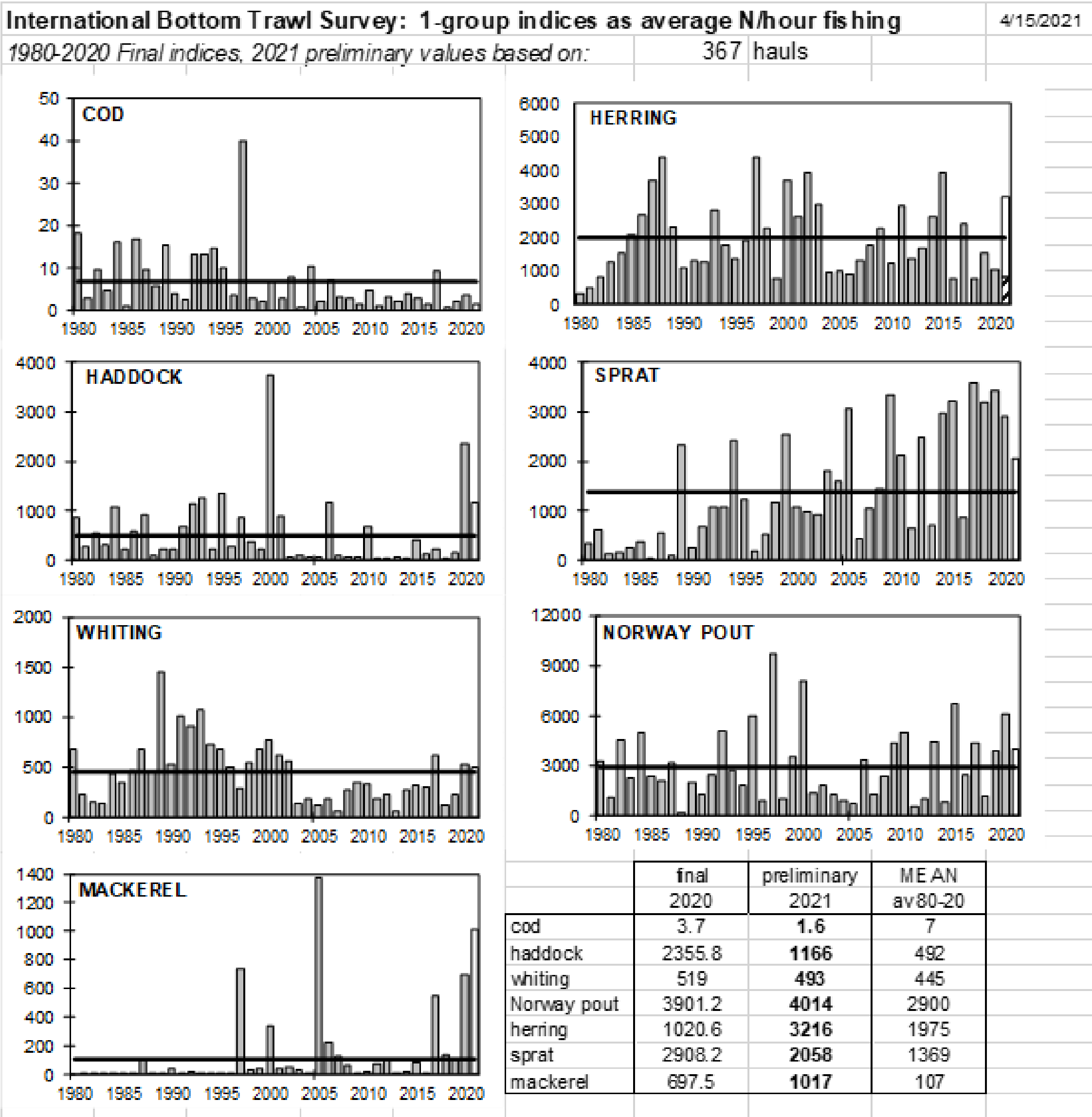
Next to the GOV and MIK tows all countries have collected additional data. All countries collected sea floor litter from the GOV tows and collected CTD (temperature and salinity) at all GOV stations when possible. A complete list of additional activities is given in Table A3.5.

Table A3.5 - Overview of additional activities in the North Sea IBTS Q1 survey in 2021

Activity	GFR	NOR	SCO	DEN	NED	SWE	FRA
CTD (temperature-salinity)	x	x	x	x	x	x	x
Seafloor litter	x	x	x	x	x	x	x
Recording of additional towing times					x		x
Water sampler (Nutrients)			x		x		x
Egg samples (Small fine-meshed ringnet; CUFES)	x	x	x	x	x		x
By-caught benthic animals		x					x
Observer for mammals and/or birds							x
Additional biological data on fish		x	x	x	x	x	
Benthic samples (boxcore, video, dredge)							
Zoo and phytoplankton		x					
Jellyfish		x					x
Hydrological transects							x

GOV

The preliminary indices for the recruits of seven commercial species based on the 2021 Q1 survey are shown in Figure A3.8. Mackerel, sprat, and haddock indicate above average recruitment, while cod indicates low recruitment below to long term average. The herring index of the North Sea alone indicate a low recruitment, this is the index as shown in previous IBTSWG reports. Including the Skagerrak and Kattegat data in the herring index indicates a recruitment well above the average index.



	final 2020	preliminary 2021	MEAN av80-20
cod	3.7	**1.6**	7
haddock	2355.8	**1166**	492
whiting	519	**493**	445
Norway pout	3901.2	**4014**	2900
herring	1020.6	**3216**	1975
sprat	2908.2	**2058**	1369
mackerel	697.5	**1017**	107

Figure A3.8 Time-series of indices for 1-group (1-ring) herring, sprat, haddock, cod, whiting, Norway pout, and mackerel caught during the quarter 1 IBTS survey in the North Sea, Skagerrak, and Kattegat. Indices for the last year are preliminary, and based on a length split of the catches. The herring index is split in a NS-part (lower part of the bar, being stripped) and the Skagerrak-part (upper bar, white); the two bars combined is the index for the NS+Skagerrak as also provided in the Datras-index products. Horizontal line is the mean 1980-2020.

Distribution maps of the 1-group of NS-IBTS target species with the limits of the species-specific stock assessment or index areas are given in Figures A3.9a to A3.9e. The values are in n/hr.

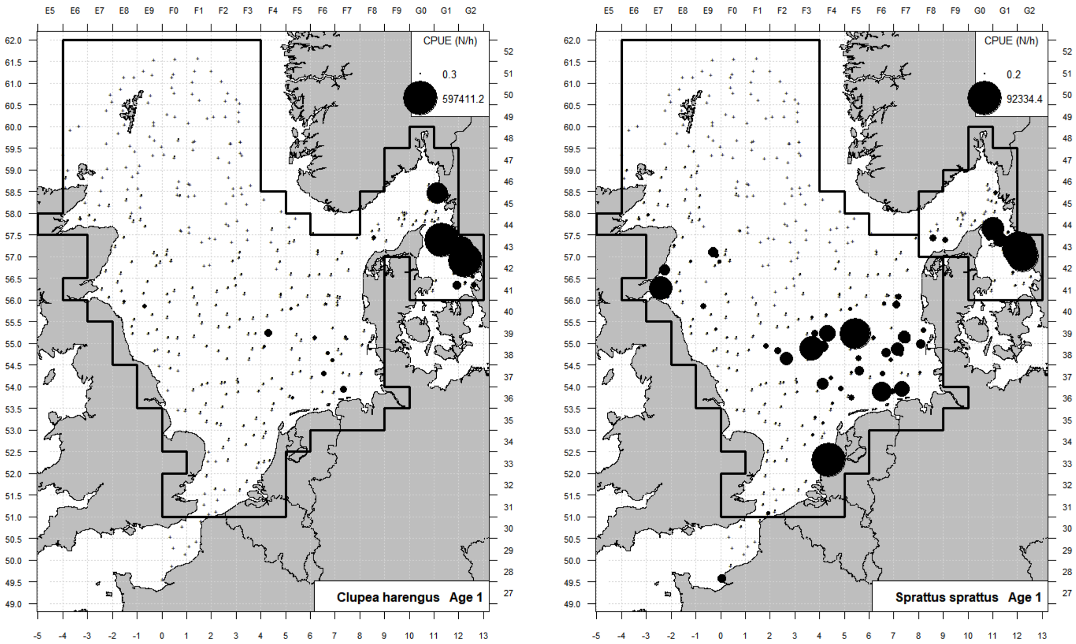


Figure A3.9a Distribution of herring and sprat age 1 in the quarter 1 IBTS 2021 (thick lines: index areas for sprat in Q1 but for herring in Q3).

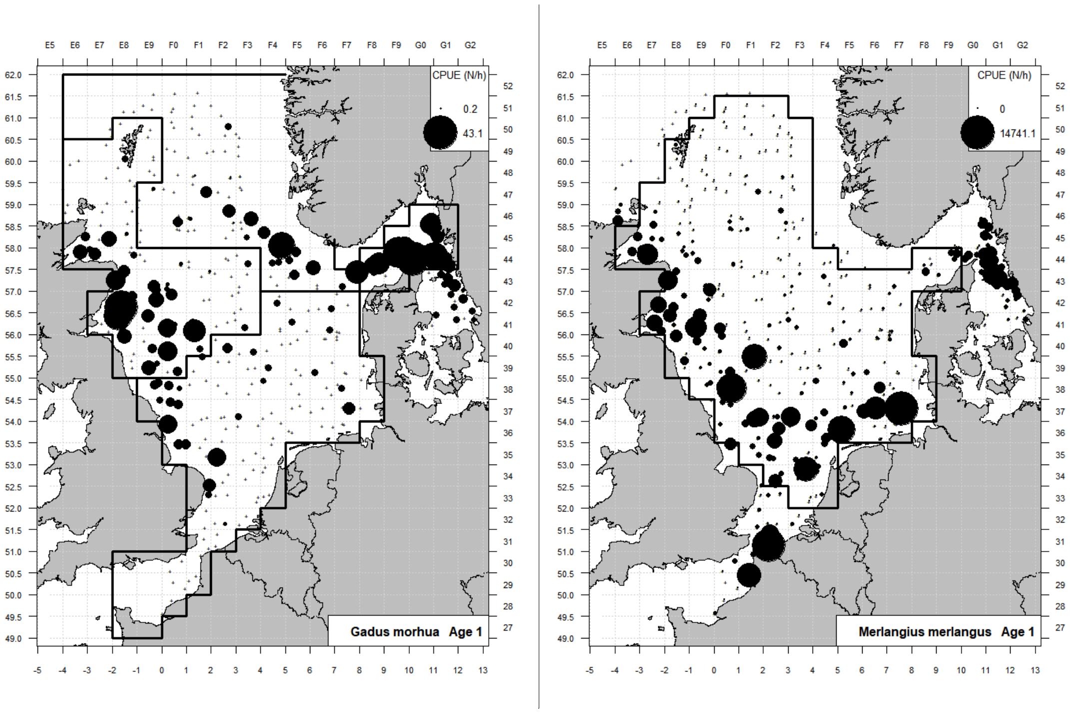


Figure A3.9b Distribution of cod and whiting age 1 in the quarter 1 IBTS 2021 (thick lines: Subpopulation separation for cod, index areas for whiting).

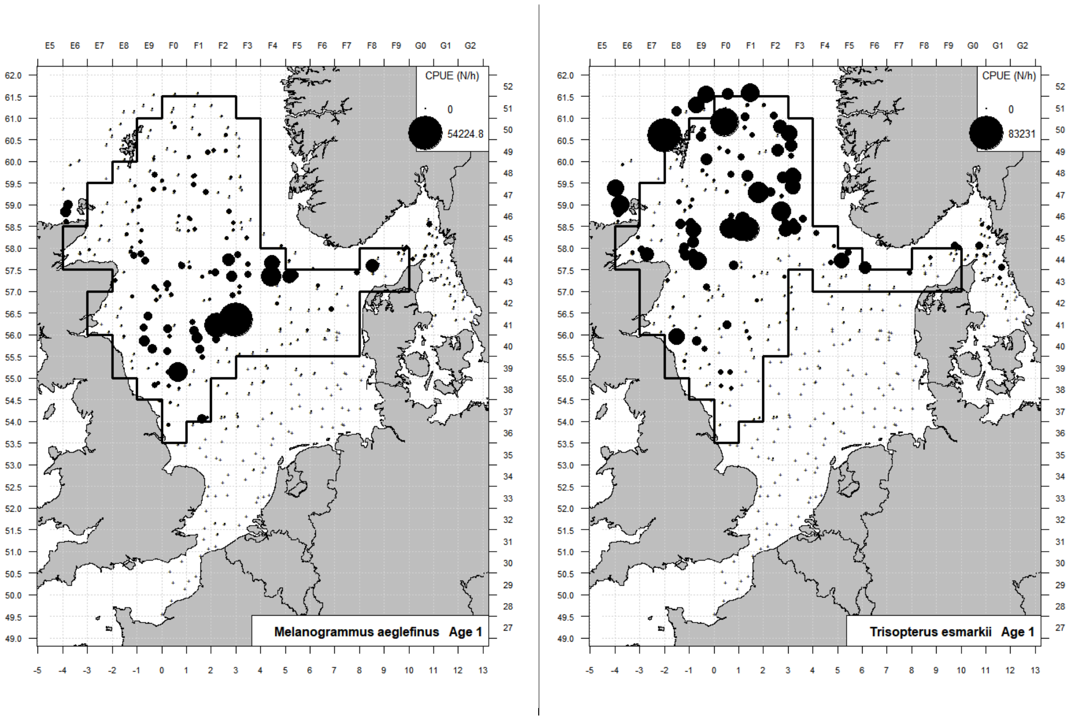
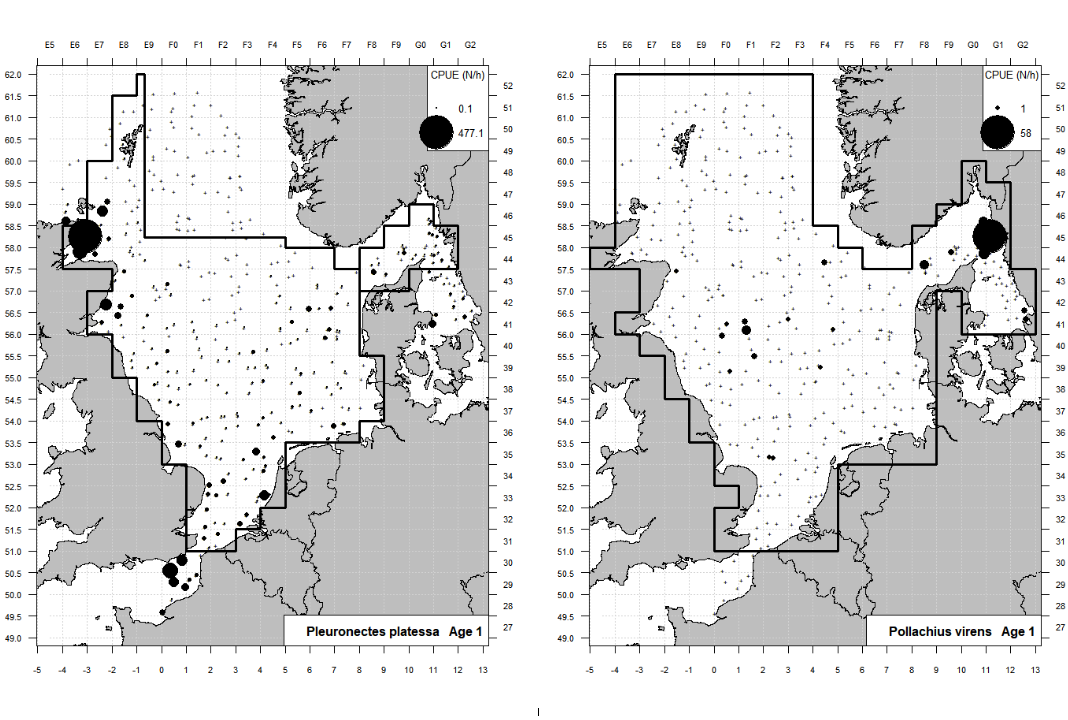


Figure A3.9c Distribution of haddock and Norway pout age 1 in the quarter 1 IBTS 2021 (thick lines: index areas).



F

igure A3.9d Distribution of plaice and saithe age 1 in the quarter 1 IBTS 2021 (thick line: old index areas).

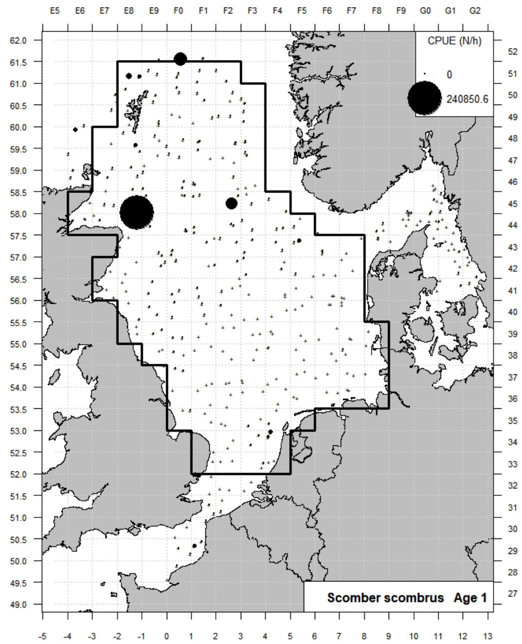


Figure A3.9e Distribution of mackerel age 1 in the quarter 1 IBTS 2021 (thick line: index area).

MIK

The International Bottom Trawl Survey (IBTS) provides the time series for 1-ringer herring abundance index in the North Sea from GOV catches carried out during daytime. In addition, night-time catches with a fine meshed 2 m ring trawl provide abundance estimates for large herring larvae (0-ringers) of the autumn spawning stock components.

The total abundance of 0-ringers in the survey area is used as a recruitment index for the stock. This year, 683 depth-integrated hauls were completed with the MIK-net, which is 117 MIK hauls more than in 2020. For the index, all hauls north of 51° N were used, in total 663 hauls, 111 more than in 2020. Due to severe weather during the second week of February, some participants could not take their stations, but these gaps could be successfully filled by other participants. Coverage of the survey area was good, mostly achieving the desired 4 hauls per ICES rectangle.

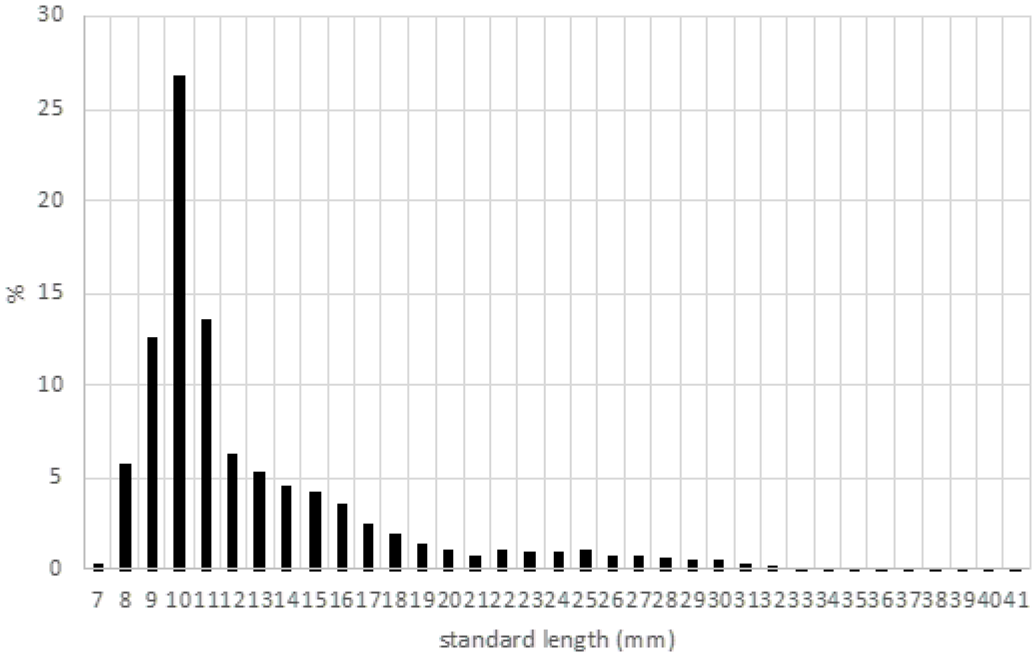


Figure A3.10. North Sea herring. Length distribution of all herring larvae caught during the 2021 Q1 IBTS.

Larvae measured between 7 and 41 mm standard length (SL). Again, and as in most years, the smallest larvae < 12 mm were the most numerous (Figure A3.10). Larger larvae >18 mm SL were rarer but were caught in higher densities than last year (Figure A3.11). The smallest larvae were chiefly caught in 7.d and in the Southern Bight. The large larvae appeared in moderate to high quantities in both, the central western and southern parts of the North Sea. In the south-eastern and eastern part of the North Sea, the potential nurseries, abundance of large herring larvae was lower than last year.

The newly proposed rule was applied to the MIK herring larvae data time series from 1992 onwards, where because of data quality issues all French data before 2008 are excluded. The 2021 index is 95.2.

Again, many sardine larvae were found in the samples. With an abundance of $7.9 * 10^9$, sardine larvae made up 8.3 % of herring larvae abundance in the entire North Sea, Channel and Kattegat/Skagerrak. Most sardine larvae occurred in the southern and south-eastern North Sea, and in the Skagerrak (Figure A3.12). Again, sardine larvae were also recorded in small amounts in the Kattegat and west of Scotland area.

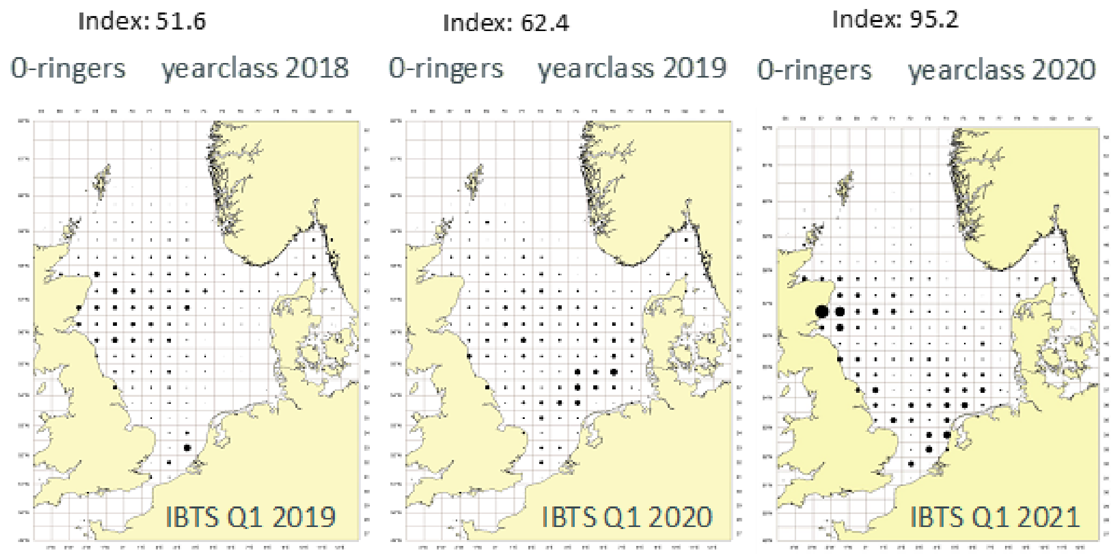


Figure A3.11. North Sea herring. Distribution of 0-ringer herring, year classes 2018–2020. Density estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in January/February 2019–2021. Areas of filled circles illustrate densities in no m^{-2}, the area of the largest circle represents a density of 3.83 m^{-2}. All circles are scaled to the same order of magnitude of the square root transformed densities.

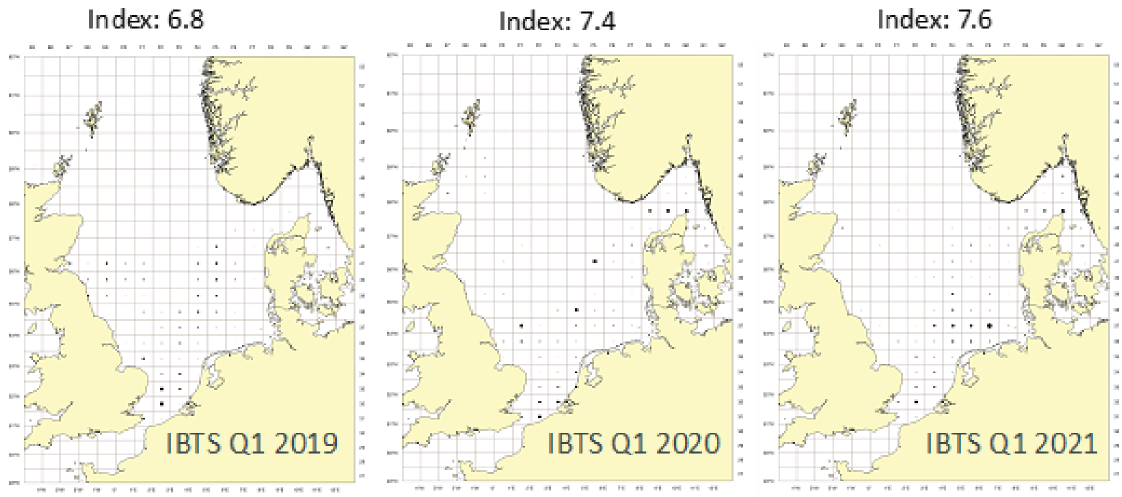


Figure A3.12: Distribution of sardine larvae in January/February 2019-2021. Density estimates of sardine larvae within each statistical rectangle are based on MIK catches during IBTS in January/February 2019–2021. Areas of filled circles illustrate densities in no m^{-2}, the area of the largest circle represents a density of 0.43 m^{-2}. All circles are scaled to the same order of magnitude of the square root transformed.

Staff exchange

No staff exchange occurred during the IBTS Q1 2021. COVID-19 made it difficult to execute the surveys already, additional travelling or exchange was not allowed and not wished-for.

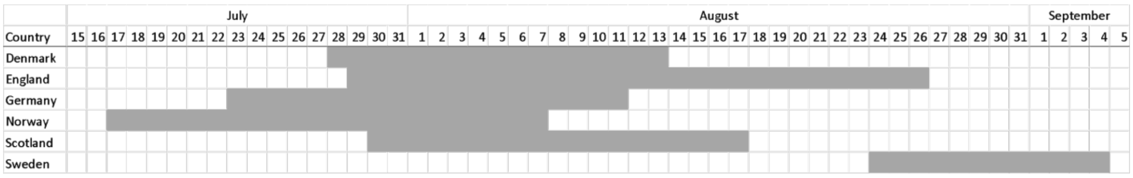
Annex 4: Summary report NS-IBTS Q3 2020

(Coordinator: Kai Wieland)

A.4.1. Participation

Six vessels participated in the quarter 3 survey in 2020: Dana (Denmark), Walther Herwig III (Germany), Kristine Bonnevie (Norway), Cefas Endeavour (England), Scotia (Scotland) and Svea (Sweden). The overall sampling period extended from 17 July to 4 September (Table A.4.1.1).

Table A.4.1.1 - Sampling periods in the North Sea IBTS Q3 survey in 2020.



In total, 355 valid standard GOV hauls were made in the planned rectangles (Table A.4.1.2). The number of rectangles with only one haul was less than in any year since 2010 and just a few rectangles did not achieve coverage of two hauls. These were rectangles which are covered largely by land, have a small amount of area at depths < 250 m, which is the maximum survey depth limit (Fig. A.4.1.1), or in which only a few tracks are known that can be fished with the GOV at low risk for gear damages.

Table A.4.1.2 - Overview of the GOV stations fished in the North Sea IBTS Q3 survey in 2020 (*: NOR missing in 42F6, ENG 2nd tow missing in 49E9; ( ): not reported to DATRAS but available at https://github.com/ices-eg or IBTSWG 2020 sharepoint).

ICES area	Country	Gear used	Number of tows planned (IBTSWG 2020)	Number of valid tows (as planned *)	Proportion of re-quested stations fished (%)	Number of addi-tional valid tows	Number of additional experi-mental tows (15, 0 min)
3a	SWE	GOV-A	26	26	100	18	-
4b	SWE	GOV-A	2	2	100	0	-
3a	DEN	GOV-A	4	4	100	0	-
4a,b,c	DEN	GOV-A	50	50	100	0	(1, 3)
4a,b,c	ENG	GOV-A	78	77	99	0	-
4a,b,c	GER	GOV-A	31	31	100	0	-
4a,b	NOR	GOV-A	48	47	98	8	-

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4a	SCO	GOV-B	50	50	100	3	-
4b		GOV-A	40	40	100	0	-

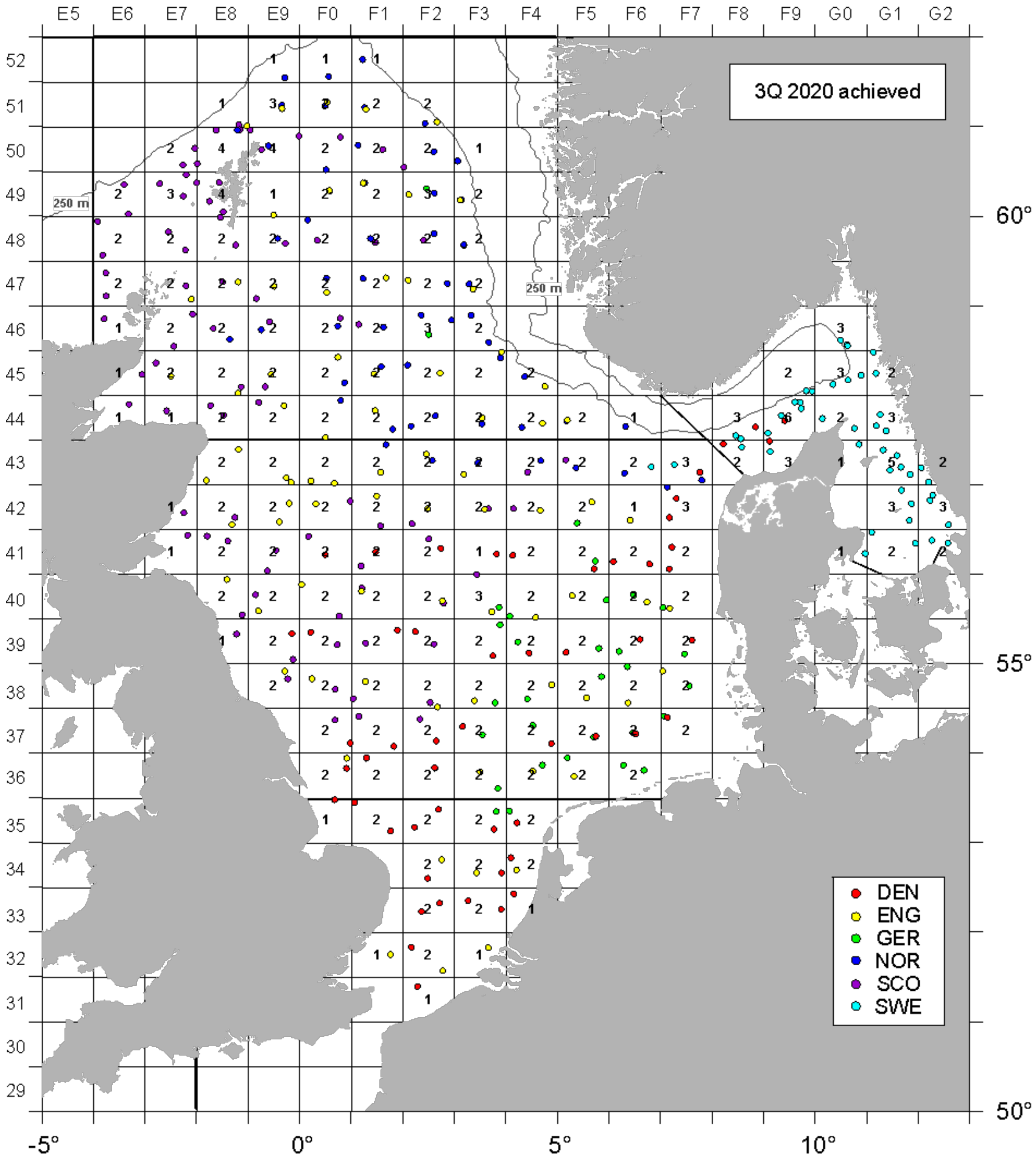


Figure A.4.1.1 - Number and start position of hauls per ICES statistical rectangle as taken with the GOV during the North Sea IBTS Q3 2020. Tows are separated into ICES Divisions in the North Sea (4a, 4b,and 4c), the Skagerrak/Kattegat (3a), and the English Channel (7d).

All standard hauls were planned of 30 min duration. However, 45 tows reported as valid to DATRAS were shorter than 27 minutes and for 13 tows duration was between 17 and 15 minutes only (Tab. A.4.1.3). This may indicate that it becomes increasingly more difficult to find full 30 min tracks due to the increasing number of obstacles such as wind farms, cables and pipelines in the North Sea. Detailed information on the reasons for shortening tows should be recorded on a tow-by-tow basis.

Table A.4.1.3 - Achieved tow durations by country, valid tows NS-IBTS 3Q 2020.

Nominal tow duration (min)	DEN	ENG	GER	NOR	SCO	SWE	Total
14	0	0	0	0	0	0	0
15	0	0	0	0	9	0	9
16	0	0	0	1	1	0	2
17	0	0	0	1	1	0	2
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	1	5	2	5	4	1	18
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	3	1	0	4
24	0	0	0	0	2	0	2
25	4	1	0	2	1	0	8
26	0	0	0	0	0	0	0
27	0	0	0	2	0	0	2
28	0	0	0	0	0	1	1
29	0	3	0	0	0	0	3
30	49	62	29	52	74	26	292
31	0	6	0	4	0	1	11
32	0	0	0	2	0	0	2
33	0	0	0	0	0	0	0

Biological data (weight, sex, maturation stage, and age material) were collected for many species (Tables A.4.1.4 and A.4.2.1.5); maturation stage can be difficult to determine outside of the spawning period and was therefore not recorded as routinely as in quarter 1. For some species, otoliths have yet not been read and thus age information shall be submitted to DATRAS at a later time.

Table A.4.1.4 - Overview of age samples collected of NS-IBTS target species during the North Sea IBTS Q3 survey in 2020.

Species	DEN	ENG	GER	NOR	SCO	SWE	Total
Clupea harengus	485	1209	218	927	916	1138	4893
Sprattus sprattus	220	0	190	60	172	551	1193
Gadus morhua	138	339	20	296	436	423	1652
Merlangius merlangus	290	1638	176	674	1202	733	4713
Melanogrammus aeglefinus	577	1684	69	832	1551	309	5022
Trisopterus esmarki	13	333	24	379	451	160	1360
Pollachius virens	3	132	5	507	139	81	867
Scomber scombrus	340	426	147	547	665	20	2145
Pleuronectes platessa	694	1228	104	60	393	356	2835

Table A.4.1.5 - Overview of additional individual biological data collected in addition to the regular measurements specified in the manual during the North Sea IBTS Q3 survey in 2020 (*: *Dipturus batis* is now considered to be two species (*D. batis* and *D. intermedius*; [1)]: individual weight, [2)]: individual weight and sex, [3)]: individual weight, sex and maturity, [4)]: individual weight, sex, maturity and age, [5)]: individual weight, sex and male maturity, [6)]: carapace length, sex and maturity, [7)]: individual weight, sex and age).

Species	DEN	ENG	GER	NOR	SCO	SWE
Amblyraja radiata		103 [3)]	1 [2)]	44 [3)]	46 [5)]	
Anarhichas lupus		9 [3)]		111 [1)]/ 26 [7)]		
Cancer pargurus		-	8 [2)]	1[2)]		
Chelidonichthys cuculus		20 [4)]				
Chelidonichthys lucerna		16 [4)]				
Dipturus batis- species complex		-				
Dipturus intermedius		0			5 [5)]	
Dipturus batis (=D. flossada)		0			1 [5)]	
Rajella linteus		-				
Dipturus oxyrinchus		0				
Engraulis encrasicolus			3 [4)]			
Etmopterus spinax		2 [3)]				
Eutrigla gurnardus		221 [4)]				
Galeorhinus galeus		0	1 [2)]			
Galeus melastomus		6 [3)]				
Glyptocephalus cynoglossus		36 [4)]				71 [4)]
Gymnammodytes semisquamatus				39 [1)]		
Helicolenus dactylopterus				1 [1)]		
Hippoglossus hippoglossus		0			1 [5)]	
Homarus vulgaris		-				
Hyperoplus lanceolatus				25 [4)]/ 88 [1)]		
Leucoraja fullonica		0				
Leucoraja naevus		34 [3)]		2 [2)]/ 2 [3)]	34 [5)]	
Limanda limanda		228 [4)]				
Lithodes maja		-	1 [2)]	6 [2)]		
Lophius budegassa		4 [4)]				
Lophius piscatorius		77 [4)]	2 [2)]			
Merluccius merluccius	65 [3)]	202 [4)]	10 [2)]		229 [2)]	148 [3)]
Micromesistius poutassou				1538 [1)]		
Microstomus kitt		235 [4)]	28 [2)]			
Molva molva		31 [4)]				
Mullus surmulletus		29 [4)]				
Mustelus asterias		18 [4)]	10 [2)]		2 [5)]	
Mustelus mustelus			6 [2)]			
Nephrops norvegicus		-	126 [2)]	1 [2)]		679 [6)]
Pollachius pollachius		0				
Raja brachyura		0	1 [2)]		1 [5)]	
Raja clavata		24 [3)]			1 [5)]	
Raja montagui		24 [3)]			14 [5)]	
Rajella fyllae		-				
Sardina pilchardus			5 [4)]			
Scopthalmus maximus		11 [4)]	2 [2)]		2 [2)]	
Scopthalmus rhombus		7 [4)]			2 [2)]	
Scyliorhinus canicula		-	10 [2)]	7 [2)]/3 [3)]		
Squalus acanthias		73 [3)]		2 [2)]/1 [3)]	66 [5)]	
Solea solea		-				9 [4)]
Trachurus trachurus				342 [1)]		
Zeus faber		1 [3)]				

Sweden has not collected mackerel otoliths in the past, mainly due to very low catches for many years but started sampling mackerel in 2019. Presently, these samples have not been aged due to lack of local age reading expertise. Sweden will continue to collect biological data for mackerel in quarter 1 but is reluctant to do so in quarter 3. The modelled bottom-trawl recruitment index used in the assessment is based on quarter 1 and quarter 4 data only. Assuming that there is no obvious end user for quarter 3 mackerel data, and given the overarching aim to optimize sampling it seems counterproductive for Sweden to initiate biological sampling of mackerel in quarter 3 in the Skagerrak/Kattegat (ICES area 3a). However, when sharing North Sea rectangles Sweden will collect biological data on mackerel in quarter 3 in order to maintain present IBTS time series, but with the expectation that the end-user needs for this data will been clarified in the near future, and a corresponding recommendation should be addressed to ICES WGWIDE.

A.4.2 Additional activities

All countries are required to collect sea floor litter from the GOV tows and CTD data (temperature and salinity, oxygen for some countries) at all GOV stations when possible. A list of other additional activities is given in table A.4.2.1.

Table A.4.2.1 - Overview of additional activities in the North Sea IBTS Q3 survey in 2020 (Water samples for CTD calibration not explicitly listed, x: routinely, (x): ad hoc studies, (1): WP2 at selected stations, *: available at https://github.com/ices-eg or IBTSWG 2020 sharepoint).

Activity	DEN	ENG	GER	NOR	SCO	SWE
CTD	x	x	x	x	x	x
Seafloor Litter	x	x	x	x	x	x
Recording of GOV deployment and retrieval time *	x	x	x	x	x	
Water sampler (Nutrients, eDNA)		x			x	
Collection of fish stomachs			x			x
Collection of fish tissue (genetics)			x			x
Jellyfish from GOV catches		x		x		
Plankton biodiversity					x	
Epibenthos (beamtrawl)			x			
Sediment (Grab)			x			x
Seabirds						
Marine mammals						
Zooplankton (e.g. MIK)	x		x (1)			
Hydrological transect						
Acoustics (Ichthyofauna)		x				

A.4.3 Issues and problems

There were no major issues or problems reported.

A.4.4 Gear geometry

The current manual (SISP 10, ICES 2020) does not specify a fixed warp length to depth ratio, as this may not fit to the different vessels. It has, however, been emphasised that each country should carefully measure net geometry, i.e. door spread and headline height over bottom (vertical net opening) and, if possible, also wing spread and adhere to their “historical” standards for warp length-to-depth as far as possible. The number of missing observations of these parameters are listed in table A.4.4.1 for each country.

Table A.4.4.1 - Number of valid tows with missing gear parameters, NS-IBTS 3Q 2020.

Parameter	DEN	ENG	GER	NOR	SCO	SWE
Net opening	0	0	14	0	0	3
Door spread	0	0	0	0	0	0
Wing spread	54	4	31	55	1	0

The applied warp length to depth ratio and the observed values for vertical net opening, door spread and, if available, wing spread, are show in figures A.4.4.1 a-c by country and are compared across countries in figure A.4.4.2. Germany, Scotland and Denmark reported relatively high values for vertical net opening at some stations. Vertical net opening in the German hauls of Q3 2020 was higher than in previous years, and in many cases outside the recommended range. Preliminary analyses have been performed, and will be expanded, to explore the possible reasons (compare 8.5.1). Most observed values for door spread were close to the theoretical values. There were, however, pronounced differences between the countries for door spread and in particular vertical net opening at a given depth. Wing spread was not measured by all countries because of missing sensors and also for those countries which had wing spread sensors, missing values and highly variable observations were common.

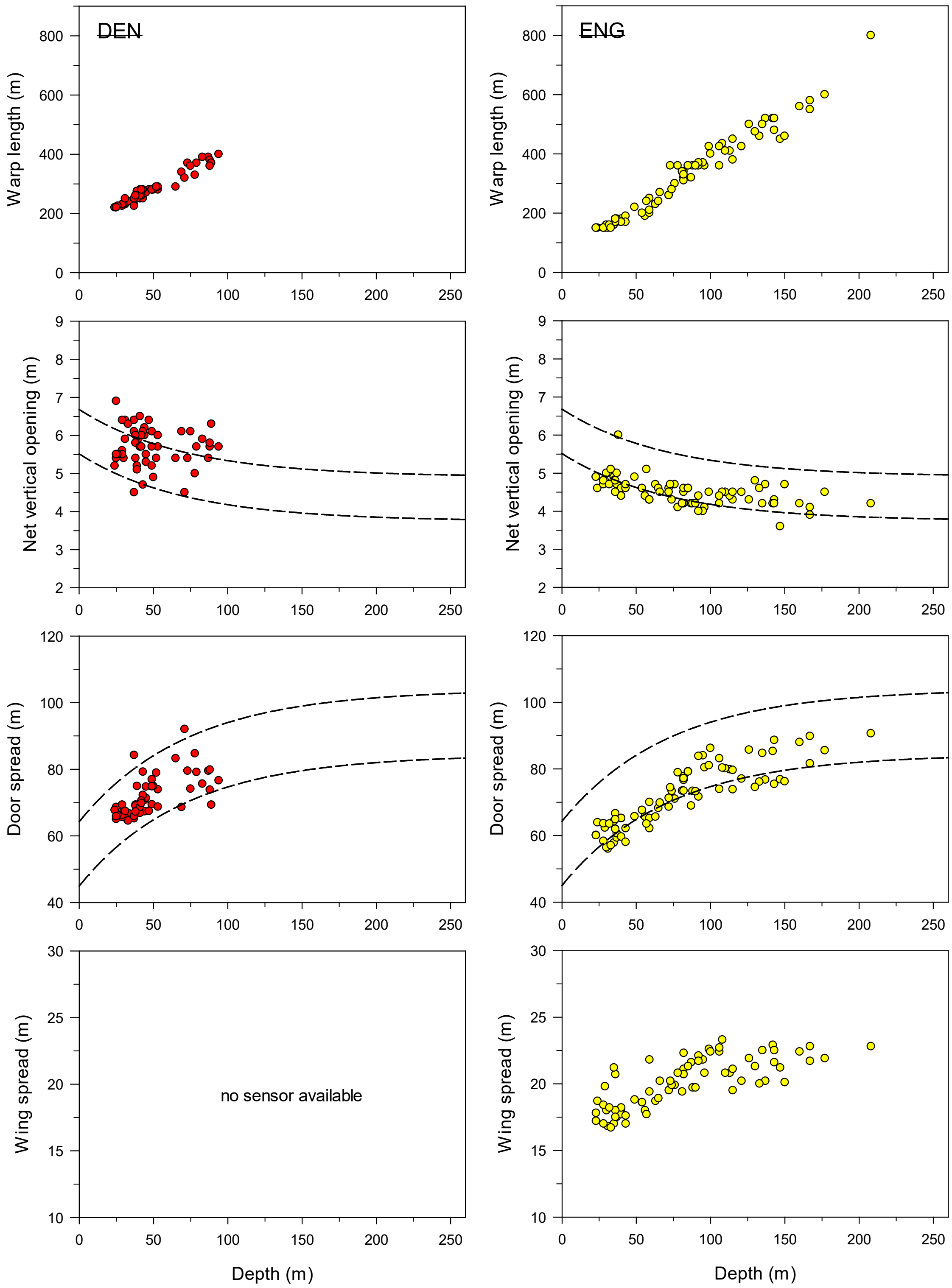


Figure A.4.4.1a - Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2020, Denmark (all tows with Vonin flyers instead of the standard Exocet kite) and England. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.

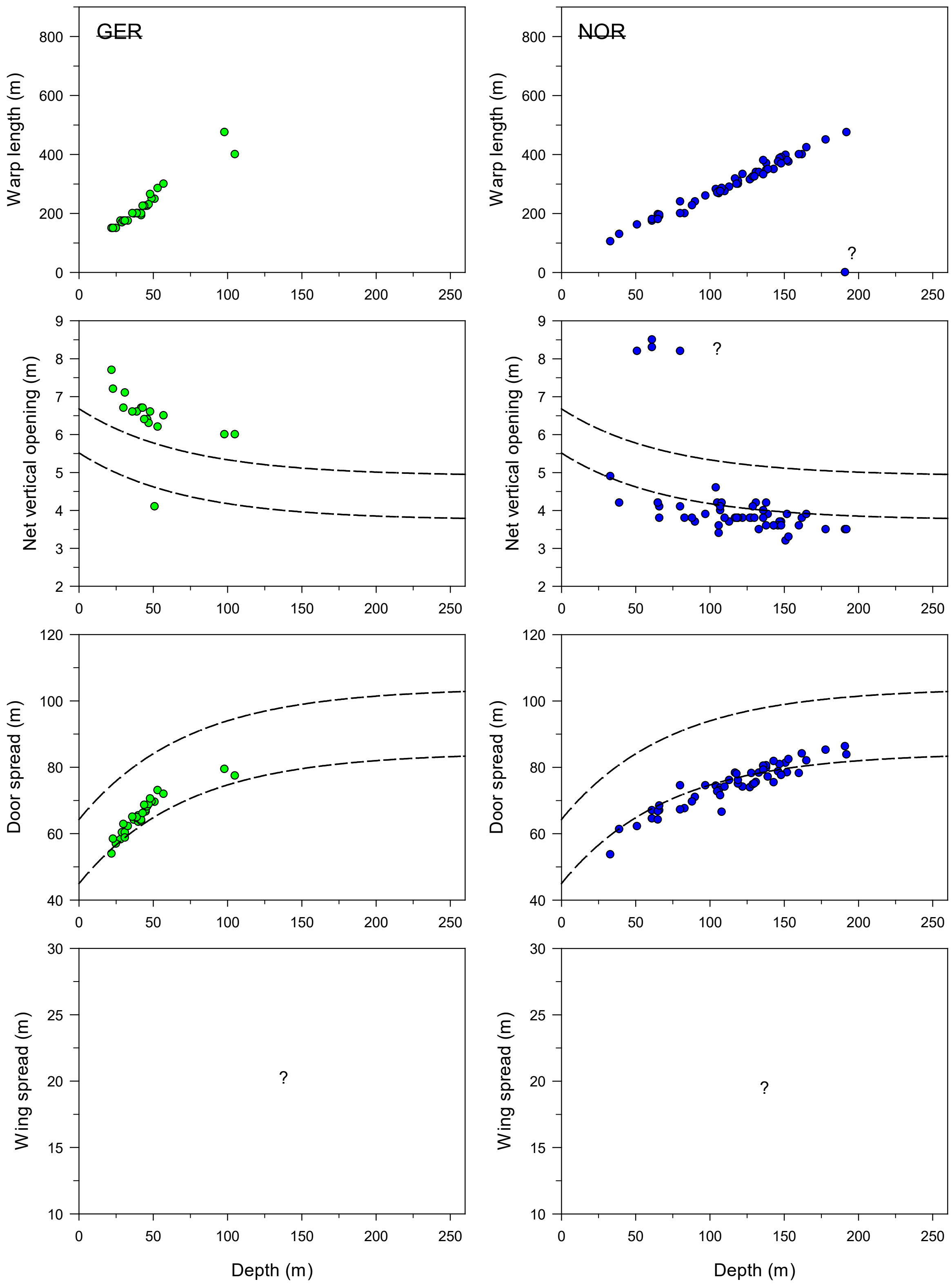


Figure A.4.4.1b - Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2020, Germany and Norway. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.

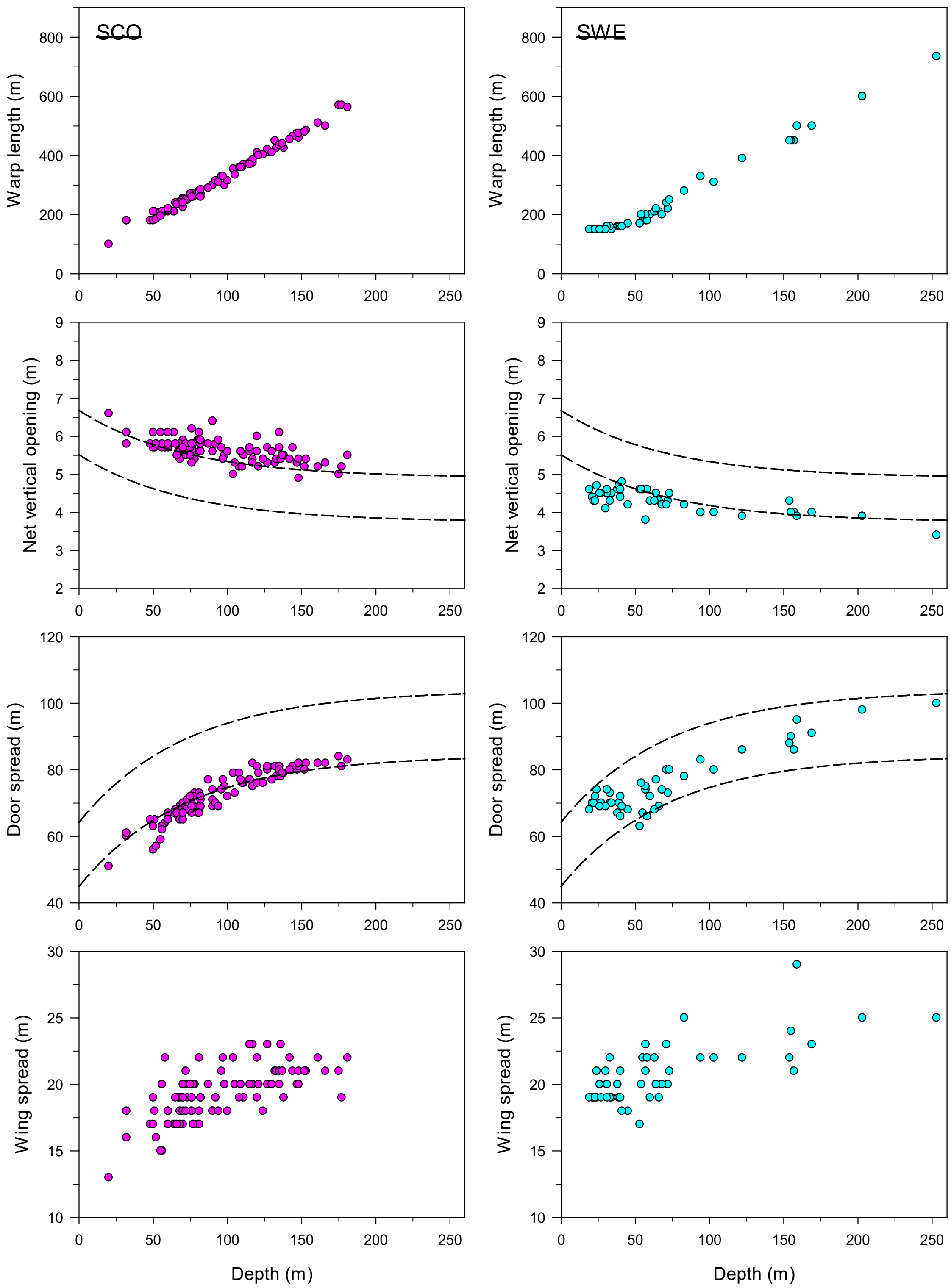

SCO
SWE
Warp length (m)
Net vertical opening (m)
Door spread (m)
Wing spread (m)
Depth (m)
Depth (m)

Figure A.4.4.1c - Warp length and net geometry related to depth by country for the North Sea IBTS Q3 2020, Scotland and Sweden. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.

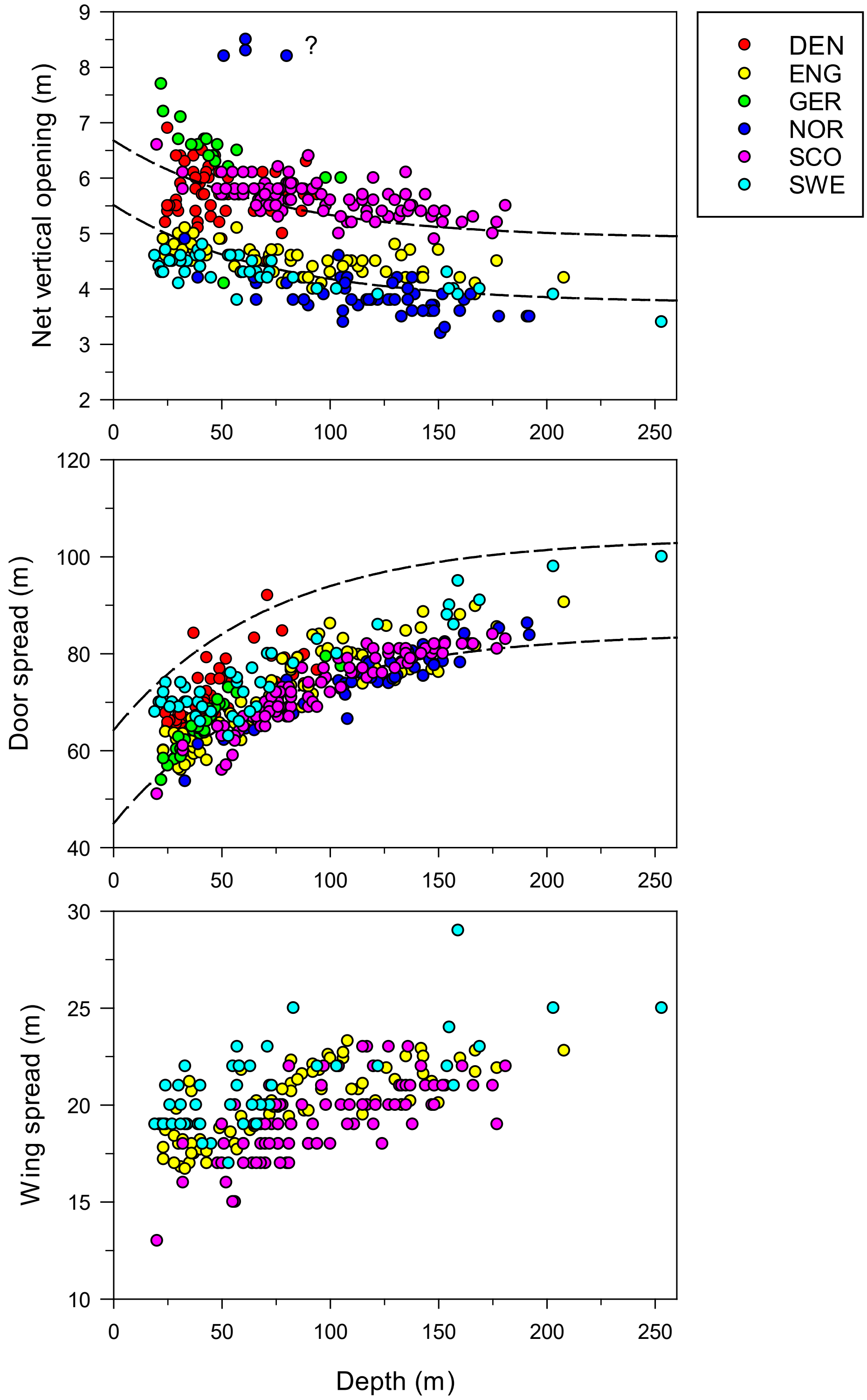


Figure A.4.4.2 - Comparison of trawl geometry related to depth between countries for the North Sea IBTS Q3 2020. Dashed lines: theoretical lower and upper limits for the standard GOV 36/47 based on flume tank experiments, see manual.

Differences in swept area at depth based on door spread between the countries were encountered where in particular the values for Scotland (low door spread and low groundspeed) deviated from the others (Fig. A.4.4.3).

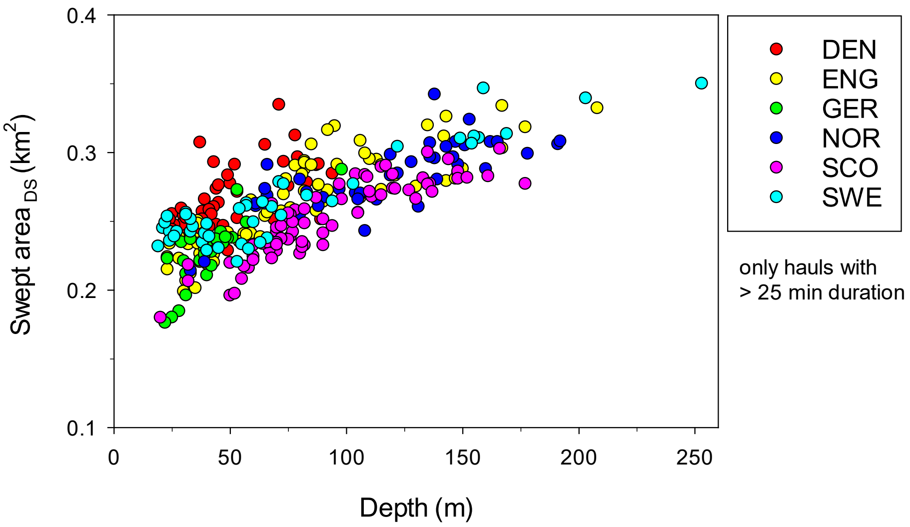


Figure A.4.4.3 - Comparison of swept area (based on door spread) related to depth between countries for the North Sea IBTS Q3 2020 (only hauls with a duration of > 25 min considered).

Speed over ground (SOG) was about 4 kn for Denmark and England, relatively variable for Germany with a mean of 3.8 kn, and was about 3.8 and 3.7 kn for Scotland and Sweden, respectively (Fig. A.4.4.4).

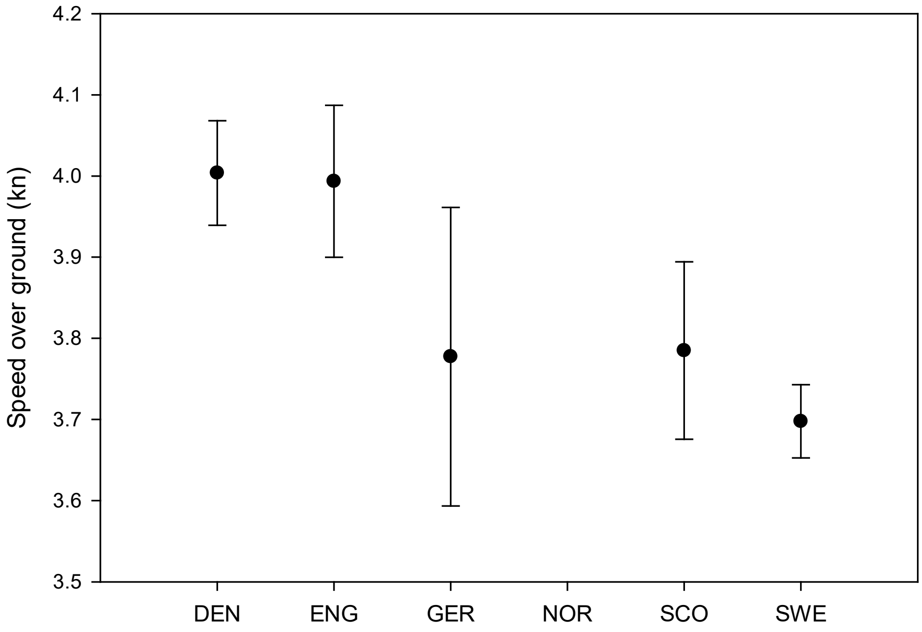


Figure A.4.4.4 - Average towing speed over ground by country for the North Sea IBTS Q3 2020 (only hauls with a duration of > 25 min considered (mean ±; 1 standard deviation; NOR: no data reported).

A.4.5 Distribution of target species

Distribution maps (in number per km², swept area based on door spread) for the recruits of the NS-IBTS standard species for the 3Q 2020survey are shown in Figures A.4.5.1. Species-specific standard areas are shown as defined by the most recent benchmarks.

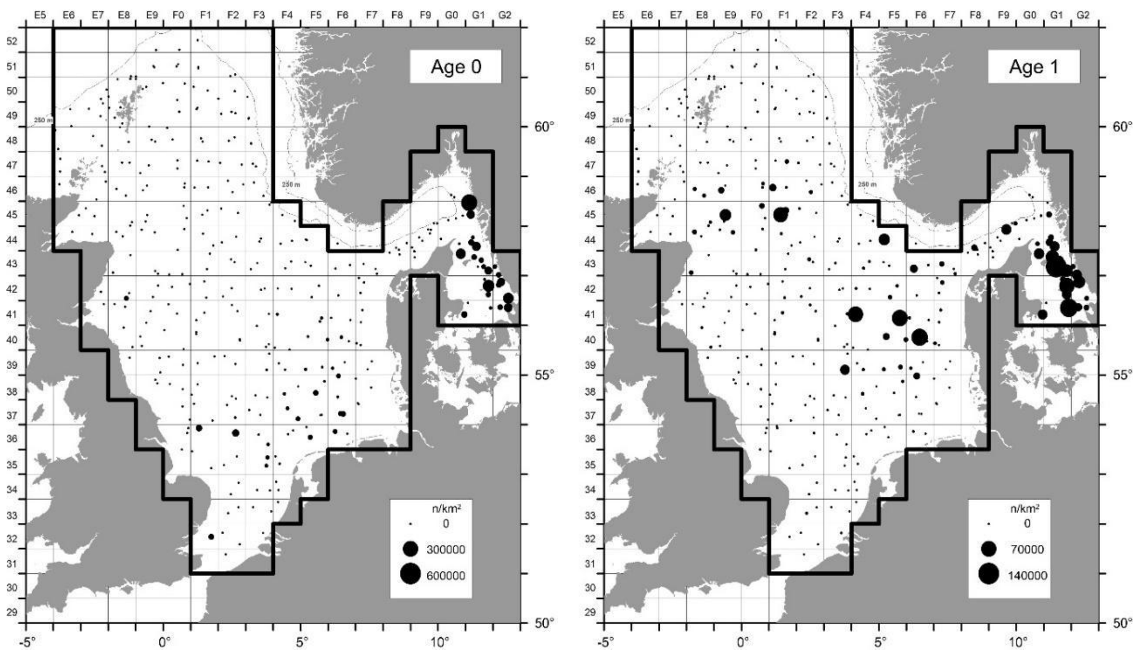


Figure A.4.5.1a - Distribution of age 0 and age 1 herring in 3Q 2020 (thick solid line represent limit of the current index area for the third quarter).

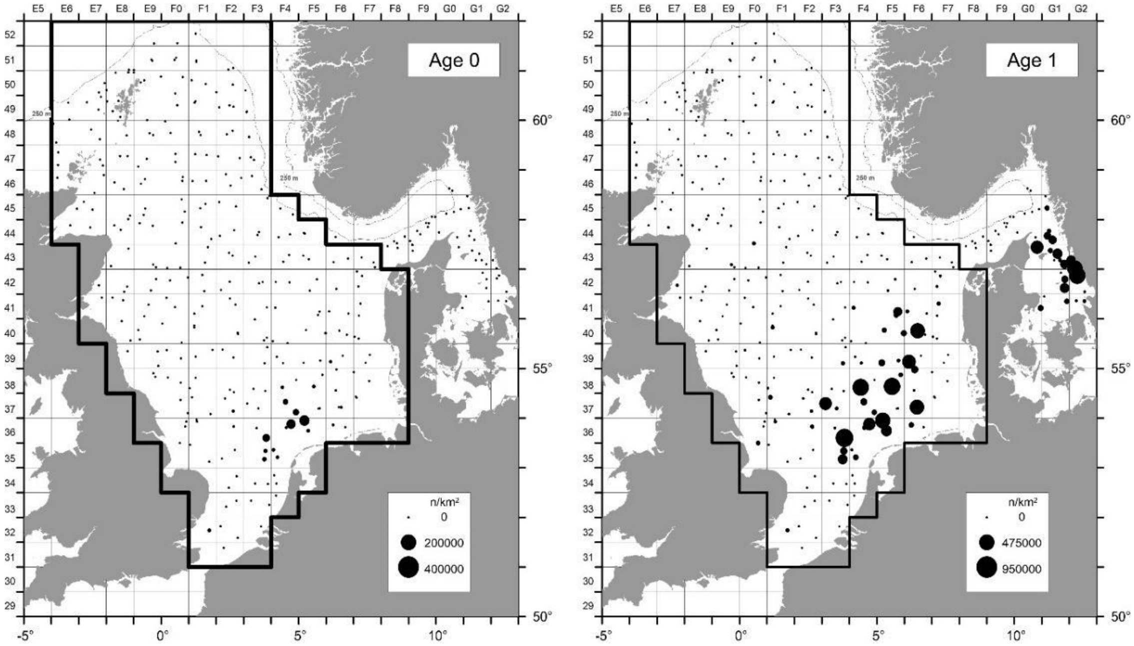


Figure A.4.5.1b. Distribution of age 0 and age 1 sprat in 3Q 2020 (thick solid line represent the limit of the current index area).

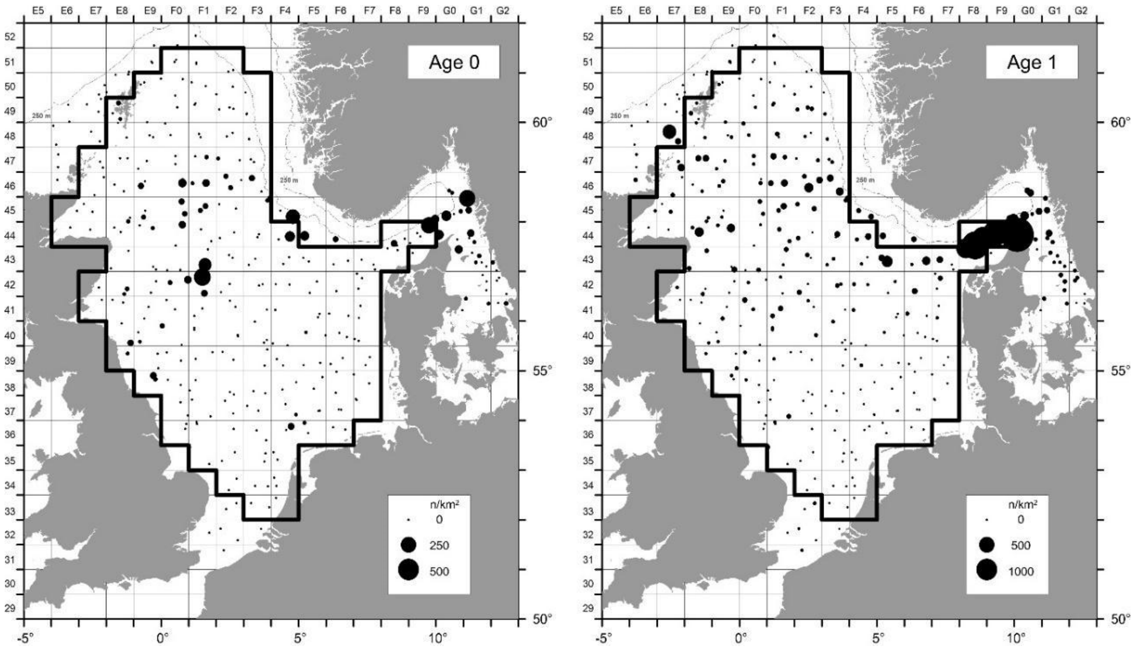


Figure A.4.5.1c. Distribution of age 0 and age 1 cod in 3Q 2020 (thick solid line represent the limit of the current index area).

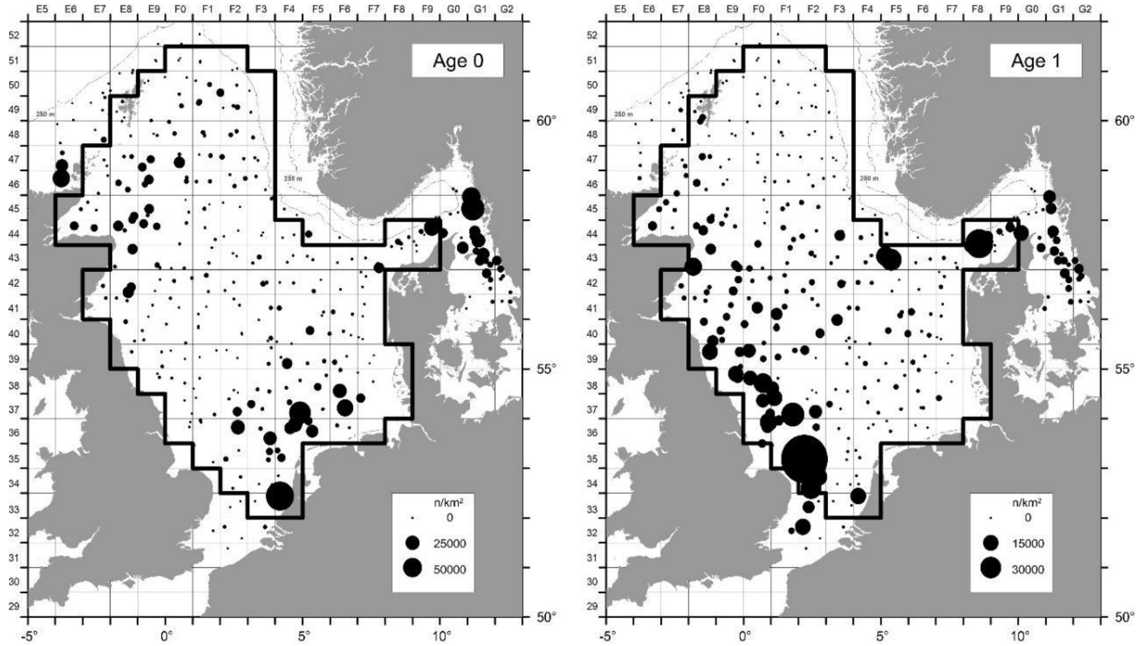


Figure A.4.5.1d. Distribution of age 0 and age 1 whiting in 3Q 2020 (thick solid line represent the limit of the current index area).

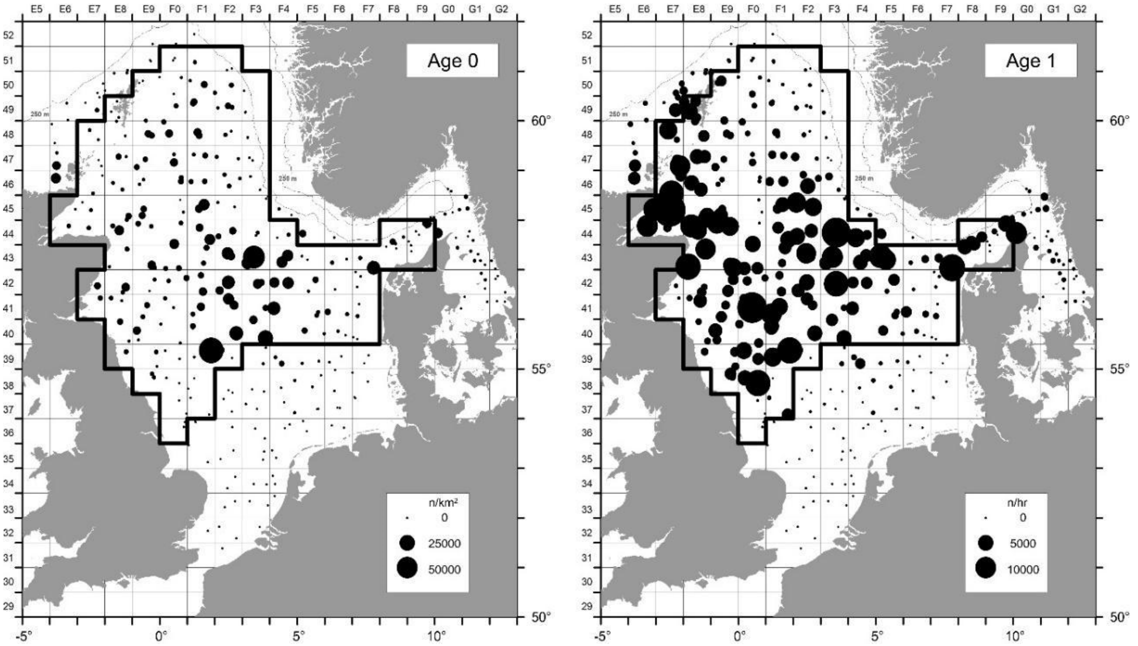


Figure A.4.5.1e. Distribution of age 0 and age 1 haddock in 3Q 2020 (thick solid line represent the limit of the current index area).

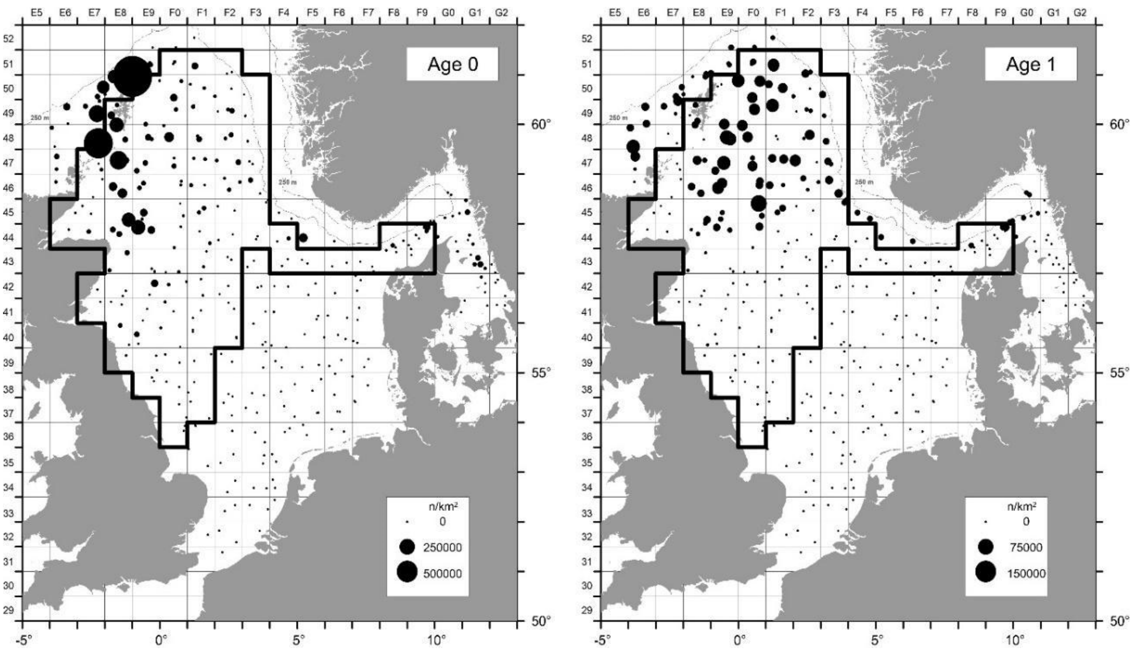


Figure A.4.5.1f. Distribution of age 0 and age 1 Norway pout in 3Q 2020 (thick solid line represent the limit of the current index area).

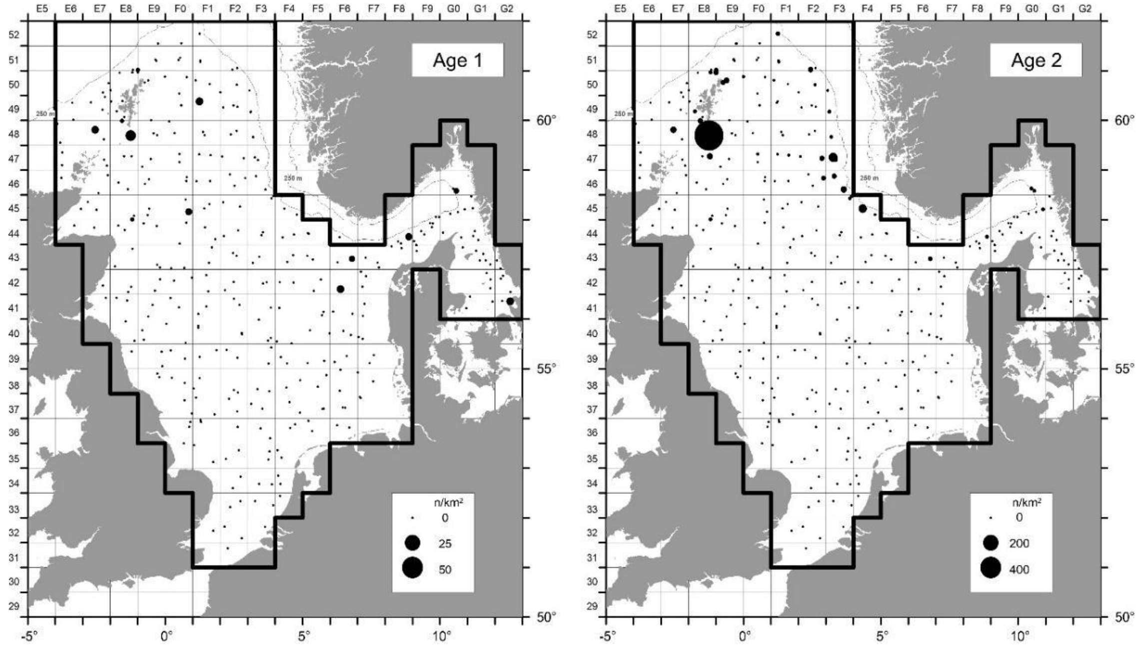


Figure A.4.5.1g. Distribution of age 1 and age 2 saithe in 3Q 2020 (thick solid line represent the limit of the current index area).

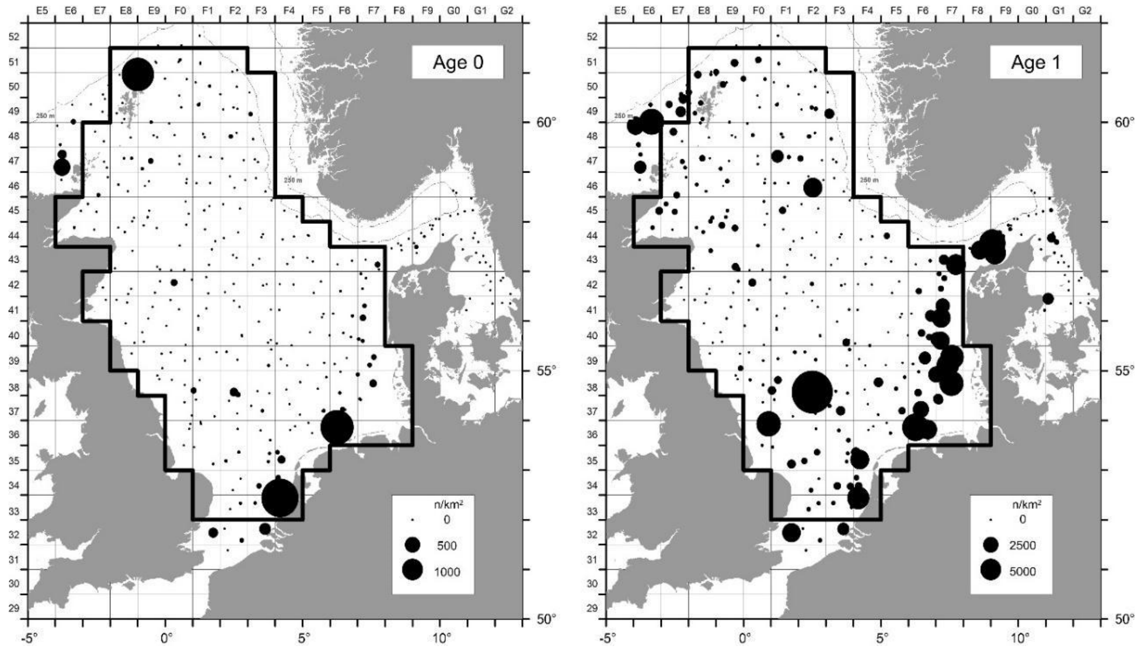


Figure A.4.5.1h. Distribution of age 0 and age 1 mackerel in 3Q 2020 (thick solid line represent the limit of the current index area).

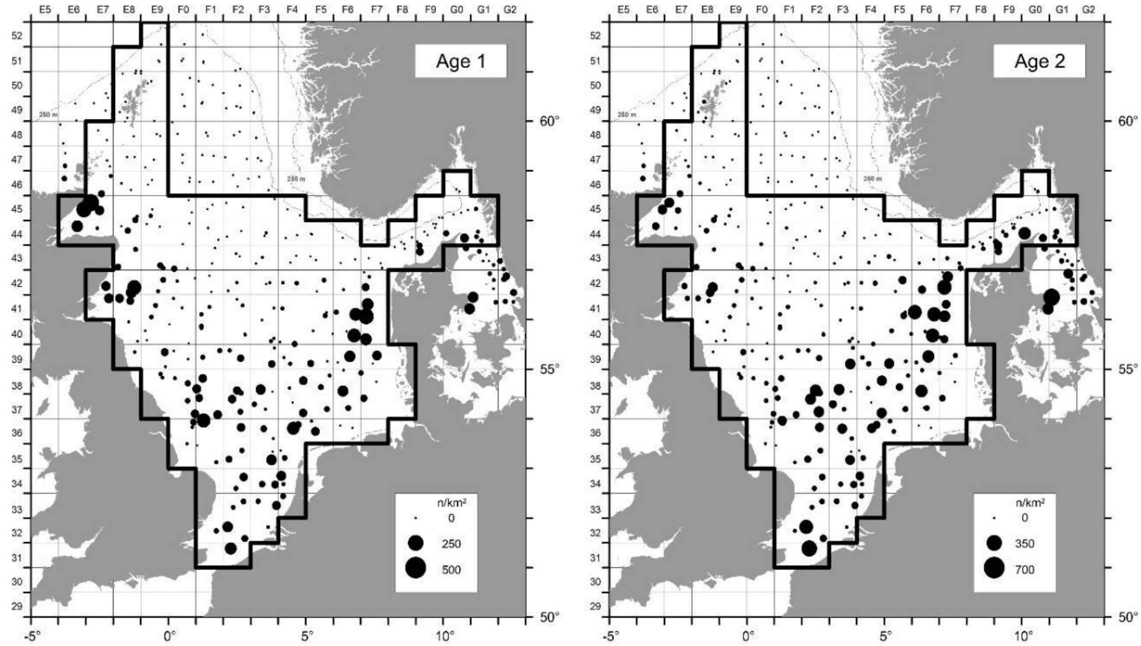


Figure 5.2.5.1i. Distribution of age 1 and age 2 plaice in 3Q 2020 (thick solid line represent the limit of the current index area).

A.4.6 Other issues

A.4.6.1 Staff exchange

No staff exchanges occurred during the 2020 Q3 surveys. However, IBTSWG continues to encourage staff exchange.

A.4.6.2 Data exchange

During the cruises, information about successfully completed hauls are regularly exchanged between survey vessels. It has been agreed that preliminary indices based on length splitting for the standard species will no longer be exchanged during the Q3 survey, since the final data for the NS-IBTS main target species (if not all species), including age information, are usually submitted to DATRAS within 2 to 3 weeks after completion of the survey.

Annex 5: Northeastern Atlantic surveys

A.5.1 General overview

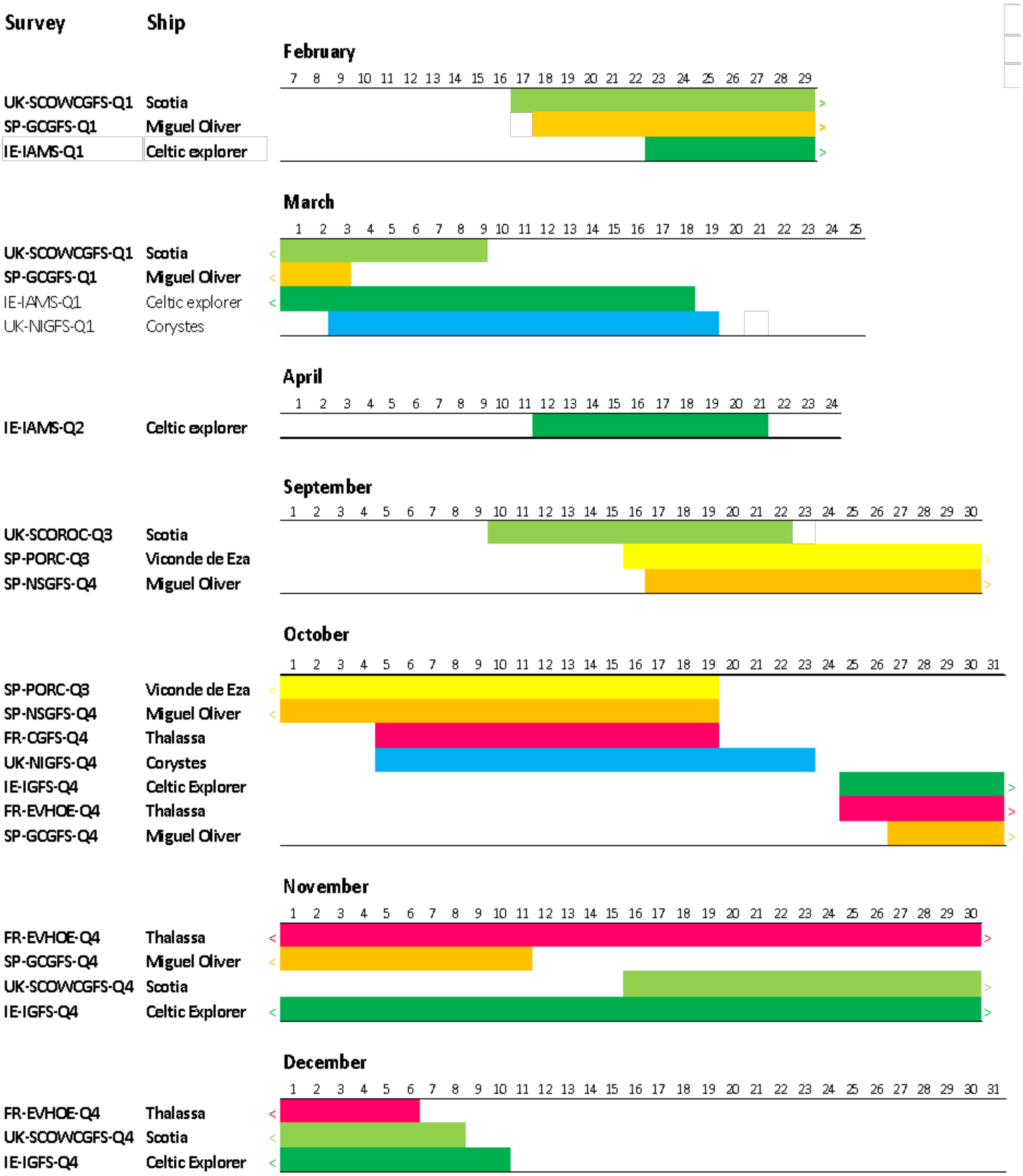
In 2020, six vessels from 5 nations performed 13 surveys along the Northeastern Atlantic (NEA) IBTS area. A total of 973 valid hauls, out of the 1174 hauls planned, were accomplished over 338 days distributed between all quarters of 2020. See table A.5.1.1. Despite the significant issues that the COVID pandemic placed on all institutes during 2020 all surveys with the exception of the Portuguese quarter 4 survey (PT-PGFS-Q4) were undertaken successfully and with the majority being completed without significant issue. Four 1st quarter surveys (Scotland, Northern Ireland, Ireland and the Spanish survey in the Gulf of Cadiz) were undertaken in February and March with the Irish anglerfish survey once again extending into April. Scotland and Spain were also active during the 3rd quarter within the regions of Rockall and Porcupine bank and the Northern Spanish Coast with France, Northern Ireland, Ireland, Scotland and Spain all active during quarter 4. Data from all NEA surveys reported here during 2020 have been uploaded to DATRAS. Selected data tables (A.5.1.1 – A.5.1.4) summarising biological as well as additional activities for all reported surveys are provided within the current section of this report however comprehensive and detailed information for all reported surveys including survey coverage plots and catch per unit effort (CPUE) estimates for target species are presented within the individual cruise summary reports and these are located in sections A.5.2 – A.5.15. Gear parameter plots for each survey are also provided in figures A.5.1.1 – A.5.1.13 and cover warp out, door and wing spread as well as vertical opening for the trawl deployments undertaken within the NEA surveys reported on during 2020.

Table A.5.1.1. Summary of surveys, hauls and days at sea per country performed in the IBTS NorthEastern Atlantic area in 2020

Country	Survey	Hauls					Days
		Planned	Valid	Null	Additional	Total	
UK-Scotland	UK-SCOWCGFS-Q1	62	57	2	-	59	21/2*
	UK-SCOROC-Q3	40	40	2	-	42	13
	UK-SCOWCGFS-Q4	62	56	7	-	63	21/2*
UK-North Ireland	UK-NIGFS-Q1	61	58	-	-	58	17
	UK-NIGFS-Q4	62	58	-	-	58	15/+5***
Ireland	IE-IAMS-Q1	105	92	5	6^	103	35
	IE-IGFS-Q4	171	127	2	8**	137	47
France	FR-CGFS-Q4	74	52	1	6	59	16
	FR-EVHOE-Q4	155	156	-	6	162	43
Spain	SP-PORC-Q3	80	80	9	11	100	34
	SP-NSGFS Q4	116	108	-	15	123	33
	SP-GCGFS-Q1	45	45	-	-	45	15
	SP-GCGFS-Q4	45	44	.	-	44	16
Portugal	PT-PGFS-Q4	96	-	-	6	6	3
Total		1174	973	28	44	1059	338

* Additional days for moorings
**GOV replacement gear trial tows
***added for pelagic tows to replace commercial survey not conducted
^ Additional deepwater tows for deepwater fisheries monitoring

Table A.5.1.2 - Overview of the surveys performed during quarters 1, 2, 3 and 4 on the Northeastern Atlantic IBTS area in 2020.



Survey
Ship
February
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
UK-SCOWCGFS-Q1 Scotia
SP-GCGFS-Q1 Miguel Oliver
IE-IAMS-Q1 Celtic explorer
March
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
UK-SCOWCGFS-Q1 Scotia
SP-GCGFS-Q1 Miguel Oliver
IE-IAMS-Q1 Celtic explorer
UK-NIGFS-Q1 Corystes
April
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
IE-IAMS-Q2 Celtic explorer
September
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
UK-SCOROC-Q3 Scotia
SP-PORC-Q3 Vizconde de Eza
SP-NSGFS-Q4 Miguel Oliver
October
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
SP-PORC-Q3 Vizconde de Eza
SP-NSGFS-Q4 Miguel Oliver
FR-CGFS-Q4 Thalassa
UK-NIGFS-Q4 Corystes
IE-IGFS-Q4 Celtic Explorer
FR-EVHOE-Q4 Thalassa
SP-GCGFS-Q4 Miguel Oliver
November
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
FR-EVHOE-Q4 Thalassa
SP-GCGFS-Q4 Miguel Oliver
UK-SCOWCGFS-Q4 Scotia
IE-IGFS-Q4 Celtic Explorer
December
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
FR-EVHOE-Q4 Thalassa
UK-SCOWCGFS-Q4 Scotia
IE-IGFS-Q4 Celtic Explorer

Biological Sampling

Table A.5.1.3 provides an overview of the number of biological samples as reported per survey within the North-eastern Atlantic area during 2020.

Table A.5.1.3. Number of individuals sampled for maturity and/or age in 2020 surveys on NEatlIBTS.

Target species	UK-SCOWCGFS-Q1	UK-SCOROC-Q3	UK-SCOWCGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1	IE-IGFS-Q4	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS-Q4
Clupea harengus	573		202				105						
Gadus morhua	174	7**	139**	136	20	51	90	4	52				
Lepidorhombus boscii			2***			179**				563	610		
Lepidorhombus whiffiagonis			133**	5	6	581	1672		434	889	478		
Lophius budegassa			14			479	215		271	19(2)	35(2)		
Lophius piscatorius			46			862	303		209	168(2)	46(2)		
Melanogrammus aeglefinus	1970	1397 **	1869 **	1047	784	612	1818		532				
Merlangius merlangus	1339	17**	1114 **	1195	1100	265	1543	257	621				
Merluccius merluccius	190		158**	49*	55	1359 **	799		1105	635	600	252 1890*	376 1197*
Nephrops norvegicus										257*	79*	773* 552(3)	135*
Pollachius virens	134		10**	2*	1*	55	11						
Scomber scombrus	318	18	245				379		228	9	429		
Sprattus sprattus	263**		156**										
Trachurus trachurus							842				435		
Additional species													
Argyrosomus regius									82				
Chelidonichthys cuculus				143	72			100	187				

Chelidonichthys lucerna													
Conger conger							76**			34	195**		
Dicentrarchus labrax							15*	211	143				
Dipturus batis cf. flossada	6†	60†	11†			96*	30*						
Dipturus batis cf. intermedia	64†		30†			215**	19						
Dipturus oxyrinchus		1†											
Engraulis encrasicolus											255		
Galeorhinus galeus			5†										
Glyptocephalus cynoglossus			32**			355**	332**		148				
Helicolenus dactylopterus										208	154		
Leucoraja fullonica		3†											
Leucoraja naevus	32†		34†			386	78*						
Loligo vulgaris												160*	
Micromesistius poutassou							632				825		
Microstomus kitt				128	16	210**	902		200				
Molva dypterygia													
Molva molva	63		45**			188	30		6	5			
Mullus surmuletus								144	101		70		
Mustelus spp.	15†		6†										
Octopus vulgaris												87*	131*
Parapeeus longirostris												1884*	2231*
Phycis blennoides									227	264	276		
Pleuronnectes platessa	65		127	456	317			336					
Trisopterus luscus								100			256		
Sepia officinalis												158*	
Solea Solea							218	300					
Scomber colias											52		
Scophthalmus maximus	1***		4***				18**	18					
Scophthalmus rhombus			1***	20	8			3					
Zeus faber				5	9		256				54		

† length, weight, sex and externally determined maturity only

* Samples collected for maturity only

** No maturity data collected,

***length, weight and sex only

(2) Otoliths + Illicia,

(3)Tagging

Additional Activities

Table A.5.1.4 gives an overview of the Additional activities performed in 2020 as reported per country/survey within the North-eastern Atlantic area.

Table A.5.1.4. Additional activities undertaken in 2020 surveys on NEatlIBTS

	UK-SCOWCGFS-Q1	UK-SCOROC-Q3	UK-SCOWCGFS-Q4	UK-NIGFS-Q1	UK-NIGFS-Q4	IE-IAMS-Q1	IE-IGFS-Q4	FR-CGFS-Q4	FR-EVHOE-Q4	SP-PORC-Q3	SP-NSGFS-Q4	SP-GCGFS-Q1	SP-GCGFS-Q4
CTD (Temp+salinity)	1	1	1			1	1	1	1	1	1	1	1
Seafloor Litter	1	1	1	1	1	1	1	1	1	1	1	1	1
1Water sampler (Nutrients)								1					
Plankton sampling								1	1				
Benthos sampling		1					1	1	1	X	X	X	X
Observers: mammals, birds								1	1		1		
Additional biological data on fish	X	X	X	X	X	1	1	1	X	X	X	X	X
Fish stomach contents				X				X	X		1	X	X
Benthic samples (boxcore, video, dredge)									X	X	X	X	X
Jellyfish							1	1					
Hydrological transect							1	1	1			X	X
Acoustic for fish species								X	X				
Multibeam: seabed mapping								X	X				
Manta trawl; microplastics								1	1				
Acoustic mooring deployment	1	X	1				X	X					
Elasmobranch tagging				X	X	1	1	X	X				

1: Annually, X: Occasional

Gear Performance

Figures A.5.1.1 – A.5.1.13 Warp length and gear parameter plots by depth for each individual survey in 2020. Where different sweep configurations exist (long and short) within an individual survey these are plotted separately within the same plot window.

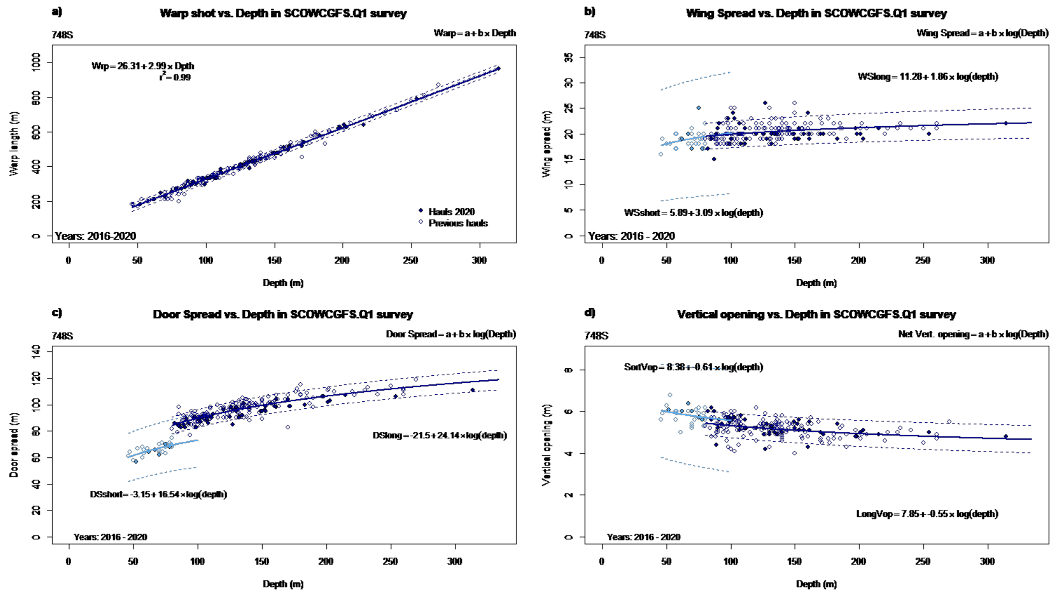


Figure A.5.1.1 – UK-SCOWCGFS-Q1

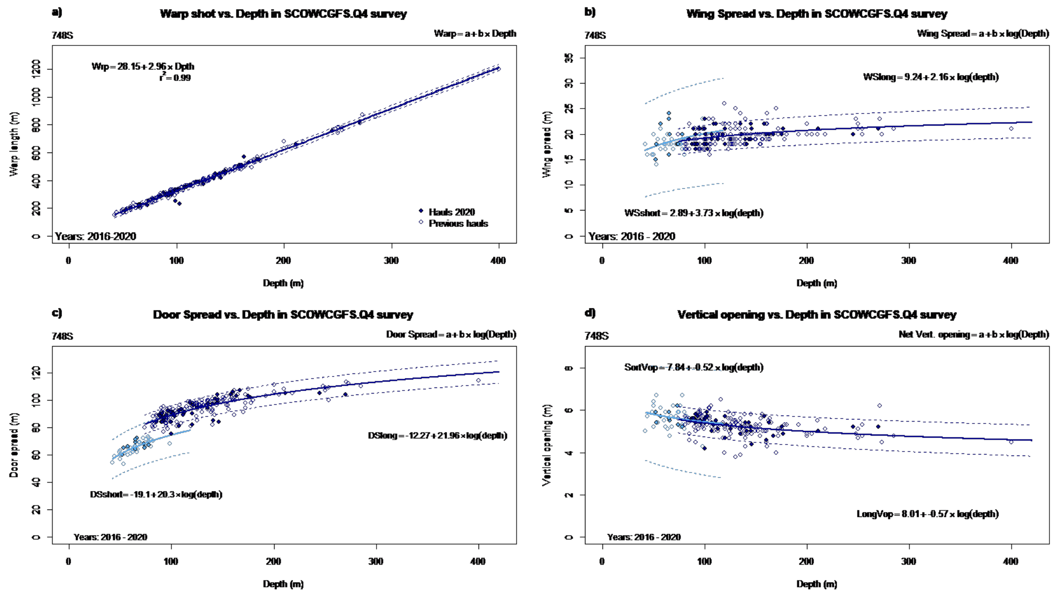


Figure A.5.1.2 – UK-SCOWCGFS-Q4

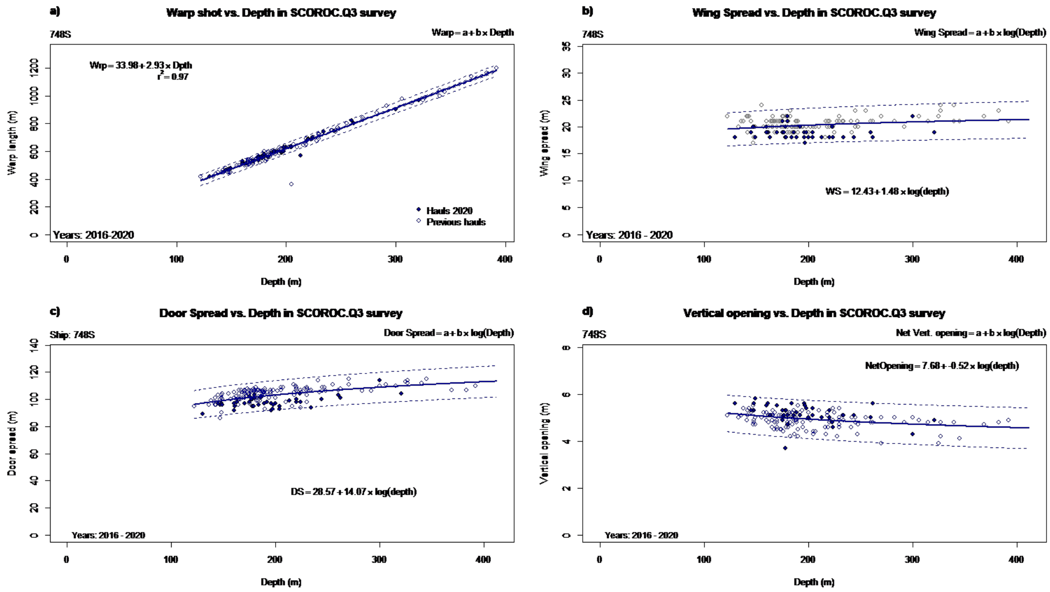


Figure A.5.1.3 – UK-SCOROC-Q3

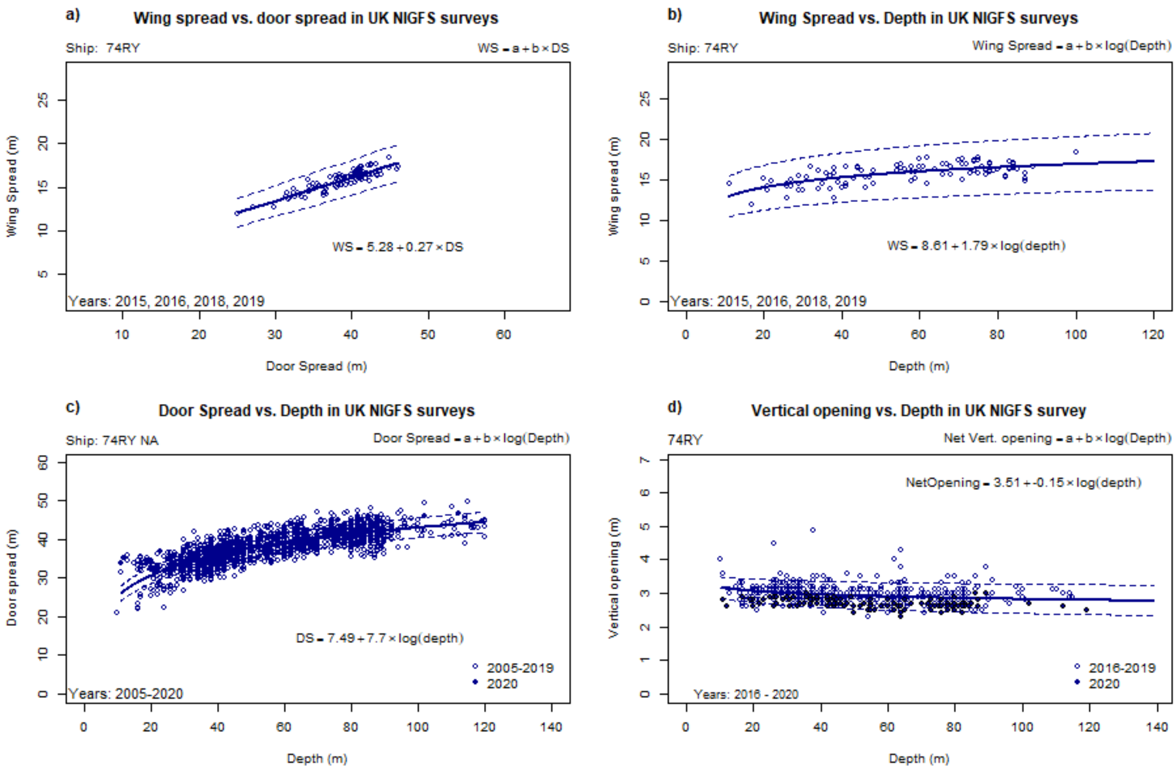


Figure A.5.1.4 – UK-NIGFS. *Northern Ireland Ground Fish Survey gear parameters showing relationships between a) wingspread and doorspread, b) wingspread and depth, c) door spread and depth and d) vertical opening and depth for both survey quarters (Q1 & Q4). Solid blue line shows fitted models. Dashed* *lines show 95% confidence intervals. Years of data for each model vary based on NIGFS data availability and model fitting considerations and are shown in the bottom left of each plot.*

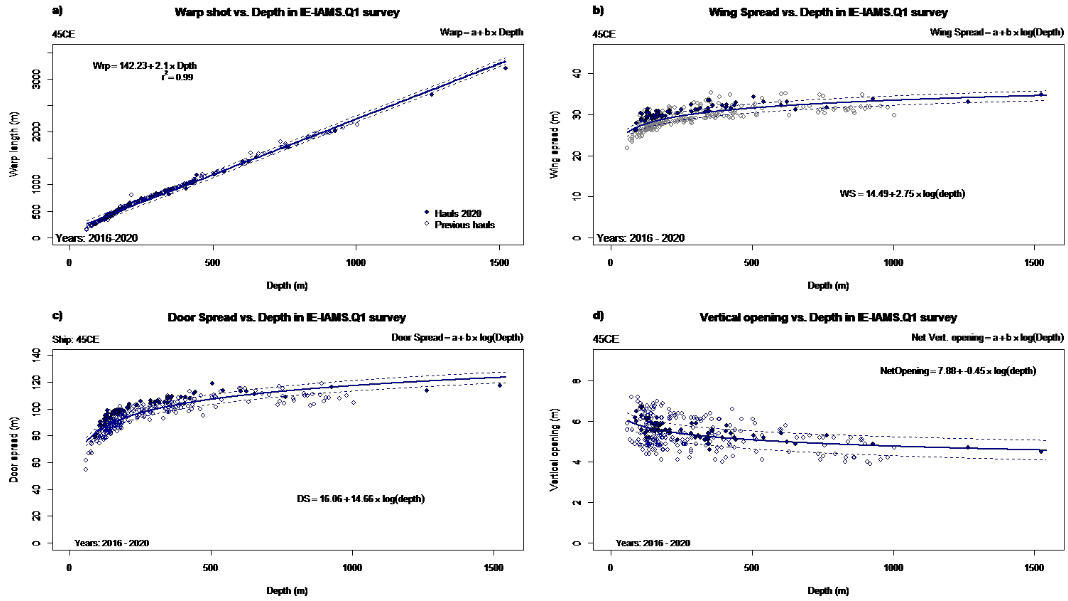


Figure A.5.1.6 – IE-IAMS-Q1

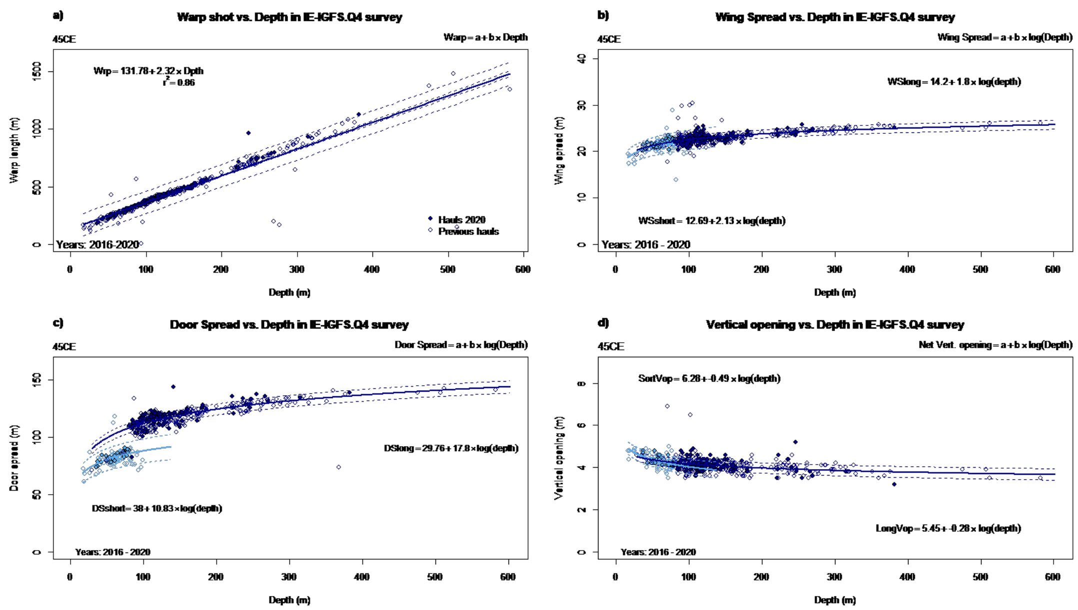


Figure A.5.1.7 – IE-IGFS-Q4

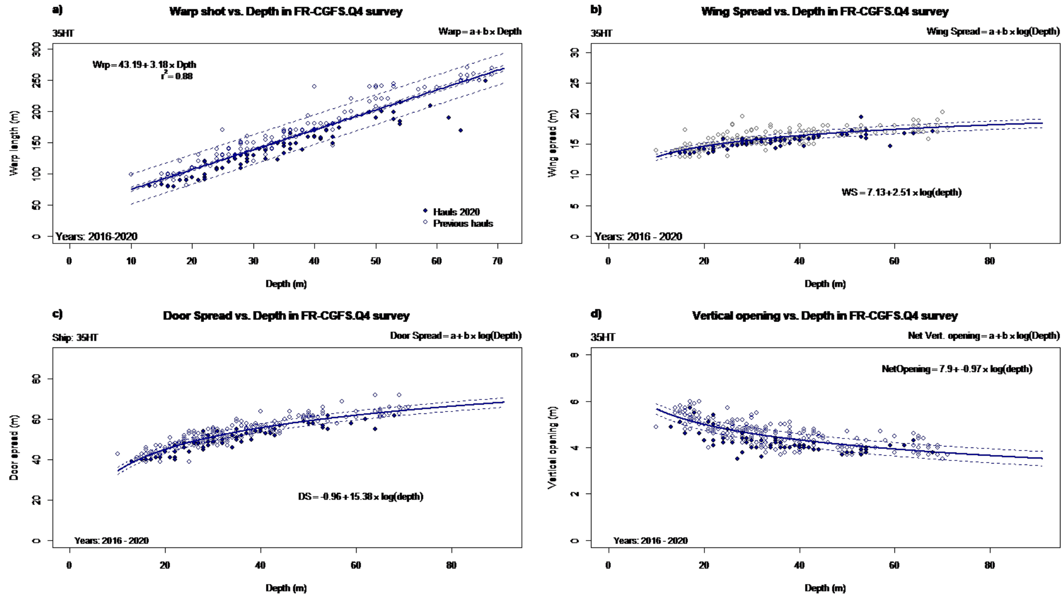


Figure A.5.1.8 – FR-CGFS-Q4

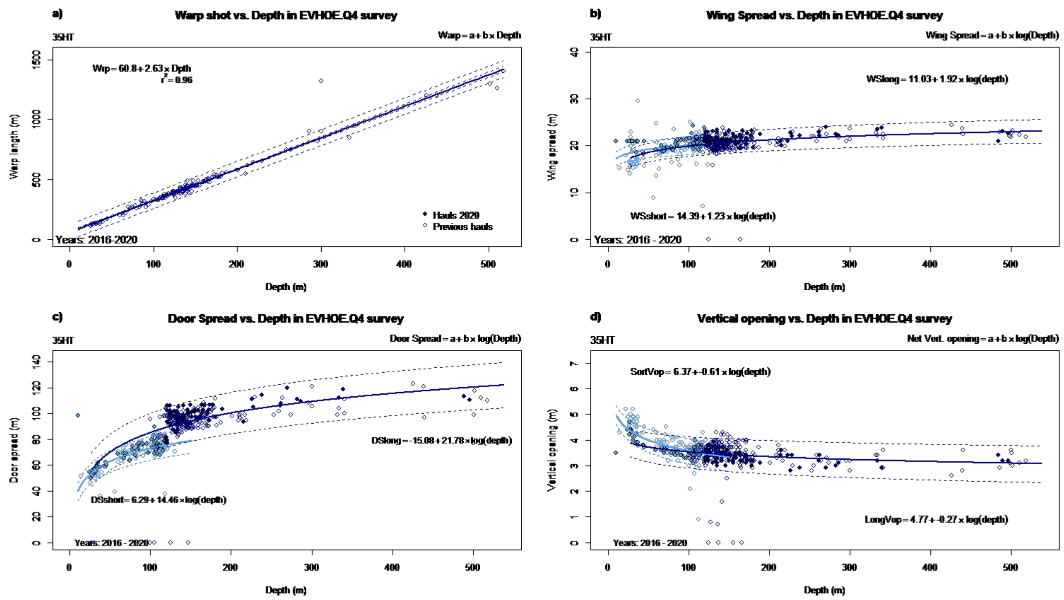


Figure A.5.1.9 – FR-EVHOE-Q4 (warp values not available for 2020)

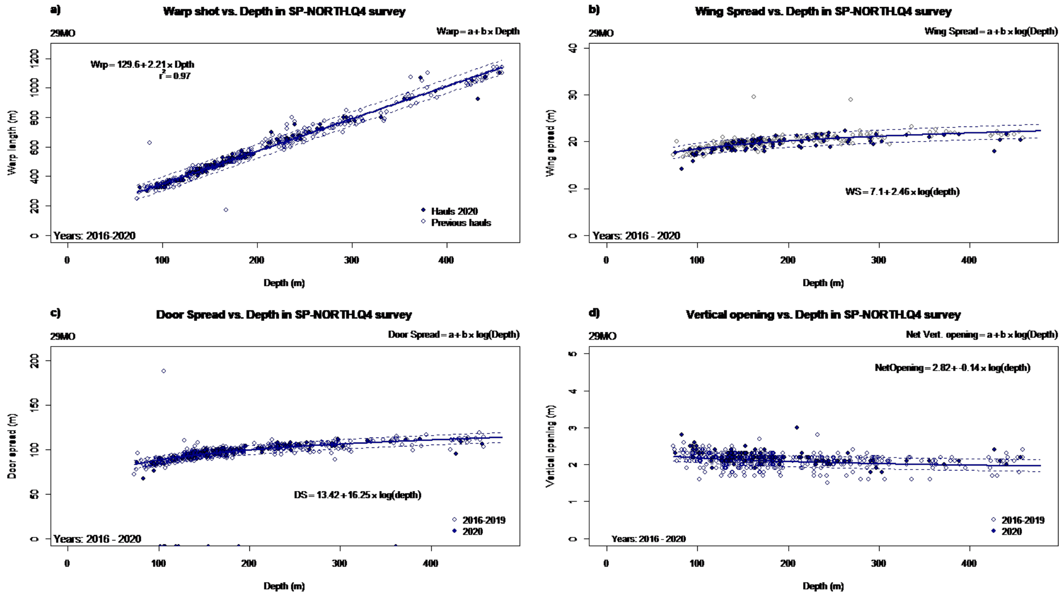


Figure A.5.1.10 – SP- NSGFS-Q4

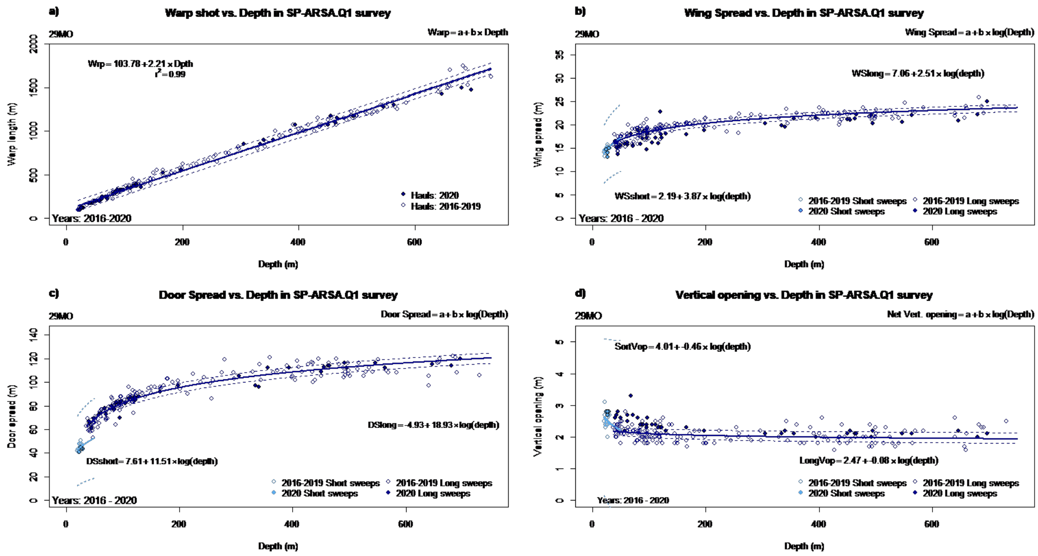


Figure A.5.1.11 – SP- GCGFS-Q1

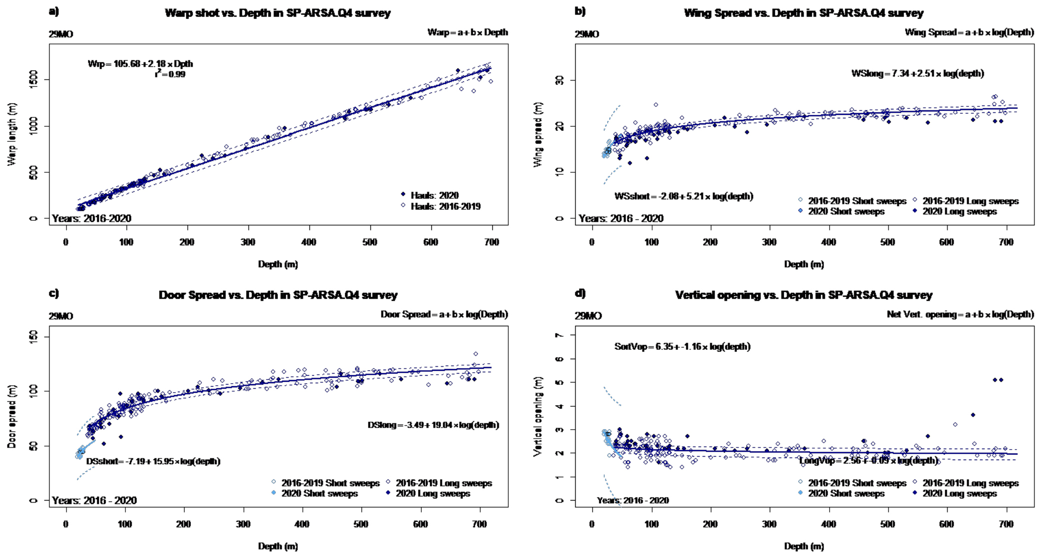


Figure A.5.1.12 – SP- GCGFS-Q4

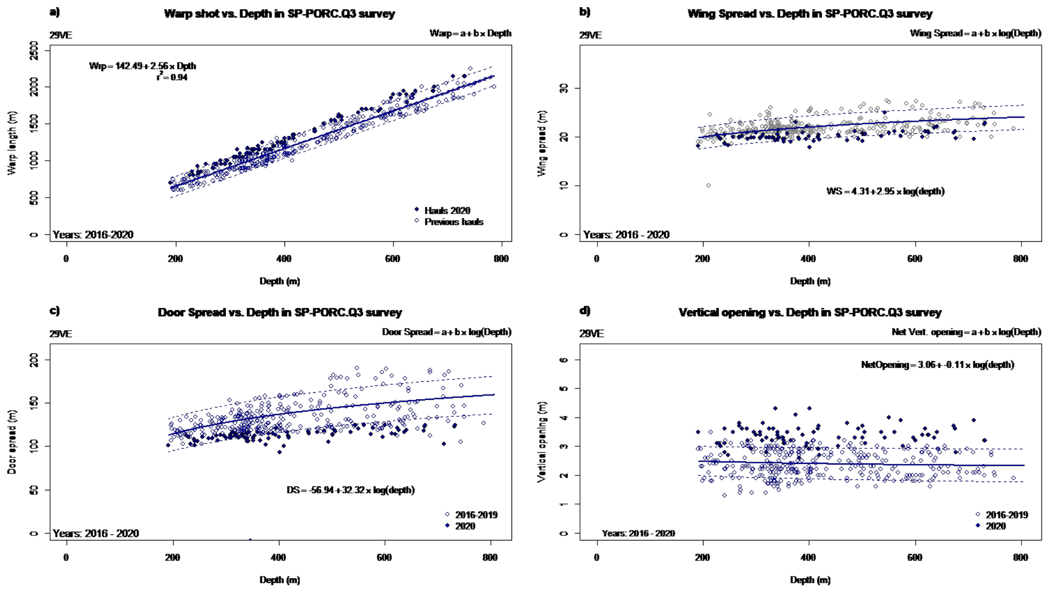


Figure A.5.1.13 – SP- PORC-Q3

A.5.2 - Scotland –SCOWCGFS-Q1 2020

Nation:	UK-Scotland	Vessel:	Scotia
Survey:	0320S (SCOWCGFS- Q1)	Dates:	16th February – 9th March 2020

Cruise:	Objectives of SCOWCGFS - Q1: • Demersal trawling survey (SCOWCGFS-Q1) off the north and west of Scotland and within ICES Subarea 6a. • To obtain temperature and salinity data from the surface and seabed at each trawling station. • Collect additional biological data in connection with the EU Data Collection Framework (DCF). • Retrieval and re-deployment of COMPASS project moorings located at discrete sites within the trawl survey area (2 additional days added to the survey).
Gear details:	GOV incorporating groundgear D was used at all stations and was deployed on 59 occasions (see table A.5.2.1). Sweeps were 97m in all cases where the mean depth was >80m (n=53), otherwise 47m sweeps were used (n=6). The following parameters were recorded during each haul using SCANMAR: headline height, wing spread, door spread and distance covered. A bottom contact sensor was attached to the groundgear and downloaded following each haul to aid validation of touchdown and lift off times for trawl.
Notes from survey (e.g. problems, additional work etc.):	Demersal Survey Despite having to contend with 3 named storms as well as vessel related issues that in addition to the 3 days spent in Campbeltown also significantly narrowed Scotia's operational trawling window the GOV(BT137) was deployed on 59 occasions during 0320S with short 47m sweeps where the depth was 80m or less being deployed on 6 occasions, the long 97m sweeps being utilised on the remaining 53 deeper hauls (51 valid standard hauls +2 invalid hauls). Of the 57 valid hauls completed all but 4 of these were completed during daylight hours. There were 2 foul/invalid hauls, haul 75 was invalid on account of scanmar sensor failure and haul 114 was foul as a result of bad ground with the belly being torn out and stones found in the codend. The locations used for the valid trawl positions during this survey were a combination of established MSS survey tows, commercial trawled areas and also completely new tows. On 21 occasions grounds were successfully utilised that previously were unfished by MSS. See figure A.5.2.1 for a plot of all survey tows. Hauls were typically of 30 min duration however various factors (large pelagic fish marks, poor ground, strong tide) resulted in lesser durations for 6 hauls (Haul no. 70, 86, 93, 110, 111 and 119). It should also be noted that no valid hauls were of a duration shorter than 15 minutes thus complying with recommendations pertaining to minimum haul duration stated in the 2009 IBTSWG report. The CTD recorder (Seabird19+) was deployed at 49 out of the 57 valid trawling stations in order to obtain a temperature and salinity profile to within approximately 5m of the seabed. Hauls 82, 91, 97, 104, 108, 117, 121 and 127 had no associated hydrography data. These

	were dropped in order to save time thus allowing the completion of another trawl station within the daylight period. COMPASS Acoustic Moorings Deployments/Retrieval 3 acoustic moorings deployed were successfully retrieved by Scotia from a possible 6 locations within the survey area. These acoustic moorings had been deployed in 2019 and their purpose was to record cetacean noise from key locations within the survey area for the COMPASS project. The mooring assemblage setup holding the acoustic sensors for the Clyde Sill and Stanton moorings failed resulting in only the base plate and associated release mechanism being recovered although the Clyde Sill sensors were subsequently recovered intact on an Ayrshire beach one month later. The Shiants, Tolsta and Stoer Pt moorings were all retrieved from the North Minch without incident. 5 new moorings were also successfully deployed back onto the same or similar locations. The Hyskier mooring located in the South Minch area was not retrieved due to time pressure on the survey. See figure A.5.2.1 for mooring locations. Additional sampling undertaken during 0320S • Collaborative PhD project within MSS/Aberdeen University investigating species diagnostics of Dipturus spp. Swab samples and Iris images. • Bobtail squid identification. All bobtail squid (Sepiolida) caught were frozen for identification at Naturalis Biodiversity Centre, Leiden. • Whole juvenile mackerel retained for investigations into variations in field metabolic rate (FMR) proxy using sagittal otoliths – Southampton University. • Pelagic fish sample collection - Approximately 6kg each of mackerel and herring from the Minch area were frozen for environmental monitoring (CRCE Scotland, Glasgow) • Regional provenance DNA work undertaken for MSS project and also international research project GECKA - anglerfish spp. • Scientific study of the European sardine integrating genetics with fisheries biology and assessment. Preserved muscle samples retained from 15 individuals (University of Lisbon). • Retention of Phakellid and Craniella sponges. Collaborative phylogenic study between MSS and the Natural History Museum. Cod tissue samples retained for regional provenance research project undertaken by MSS.
No. fish species recorded and notes on any rare species or unusual catches:	Catch Results *(2019 results presented in italics)* A total of 101 species were recorded for an overall catch weight of ~35.5 tonnes (*98, 22.3*). Major species components in approximate tonnes included: haddock *Melanogrammus aeglefinus* – 5.45 (*5.56*), mackerel *Scomber scombrus* – 10.8 (*0.44*), cod *Gadus morhua* – 0.29 (*0.13*) Norway pout *Trisopterus esmarkii* – 4.52 (*1.72*), whiting *Merlangius merlangus* – 2.84 (*1.65*), herring *Clupea harengus* – 1.56 (*3.5*), and scad *Trachurus trachurus* – 0.84 (*2.7*). The weight of whiting caught in 2020 (2.84T) was also significantly up compared to 2019 (*1.65T*). Overall weight of haddock is virtually unchanged compared to 2019. There was a notable increase in adult mackerel encountered during the 2020 survey compared to 2019. Mackerel catches reported in 2020 (10.8T) were up by over 200% on those reported in 2019 (*0.44T*) with most of those caught during 2020 being adult fish which were almost completely

absent during the survey in 2019. Between them stations 94 and 99 accounted for over 9 tonnes of the mackerel caught during the entire survey. (See figure A.5.2.1 for station locations). Table A.5.2.2 provides overall catch rates per unit effort (CPUE) of the above species and several other major species.

The CPUE index (numbers caught per hour fishing) for 1-group gadoids (cod, haddock, whiting and saithe) weights the indices for each of the 11 sampling strata by the surface area of said stratum. These are then pooled to produce the index for ICES Subarea 6a. Results for all age classes of the major commercial gadoid species are shown in table A.5.3.3 for 2020 while those of 1-groups only for period 2011-2019 are shown in table A.5.2.4.The overall CPUE by weight for those same species over the same period are displayed in table A.5.2.5.

Contrasting signals were observed in the survey CPUE indices with modest increases recorded in the 1- group abundance estimates for cod and also whiting. Numbers of 1 group haddock are significantly down after last year's record breaking high and a slight decrease was also recorded for 1 group Norway Pout. For the second year in succession no 1 group saithe were recorded during the survey. Overall CPUE by weight (kg/hr) was up for all main commercial species and was significantly higher for whiting and Norway Pout compared with 2019. Notable species encountered during the survey included a reticulated dragonet (*Callionymus reticulatus*) that was recorded from Donegal Bay (station 109) and a six gilled shark (*Hexanchus griseus*) that was recorded and subsequently returned very much alive from station 125 which is within the Windsock stratum.

Biological Sampling

In total 6251 biological observations on selected species were collected including a number collected in support of EU Data Collection Framework (DCF). A summary of numbers collected for all species is displayed in Table A.5.2.6.

Marine Litter

All litter picked up in the trawl was classified, quantified and recorded prior to being retained for appropriate disposal ashore.

Monitoring of Non Indigenous Invasive Species (NIS)

All catches were screened for the presence of selected NIS species with the results being reported back to the project coordinator at CEFAS.

2 male orca (Orcinus orca) were spotted whilst deploying the trawl on station 114, SW of Barra Hd. It is interesting to note that the catch from that haul was predominantly mackerel.

Table A.5.2.1: Number of stations surveyed/gear during 0320S

ICES Divisions	Strata	Gear	Stations Planned	Valid Stations Achieved	Additional Stations	Invalid Stations	% Stations Achieved	Comments
6a	All	GOV-D	62	57	0	2	92	Severe weather/multiple vessel issues

Table A.5.2.2. Overall CPUE of major components of combined catch Q1 2020

Species	Common name	kg/hr	no/hr
Melanogrammus aeglefinus	Haddock	198.1	826
Scomber scombrus	Mackerel	393.2	1833
Gadus morhua	Cod	10.4	6.4
Trisopterus esmarkii	Norway Pout	164.6	9696
Merlangius merlangus	Whiting	103	758
Clupea harengus	Herring	56.7	1336
Trachurus trachurus	Horse Mackerel	30.4	207
Scyliorhinus canicula	Lesser Spotted Dogfish	53.9	101
Pleuronectes platessa	Plaice	2.8	18.5
Eutrigla gurnardus	Grey Gurnard	37.8	293
Capros aper	Boar Fish	17.4	315
Squalus acanthias	Spurdog	13.4	9.5
Pollachius virens	Saithe	16.1	6.5
Merluccius merluccius	Hake	13.9	132
Dipturus intermedia	Flapper Skate	10.4	2.8
Loligo ssp	Long Finned Squid	7	57.2
Raja montagui	Spotted Ray	6.1	7.2
Lophius piscatorius	Angler	5.6	2.2
Sprattus sprattus	Sprat	4.4	624
Raja clavata	Thornback Ray	12	10.3
Chelidonichthys cuculus	Red Gurnard	12.7	37.6
Micromesistius poutassou	Blue Whiting	41.2	720
Limanda limanda	Common Dab	5.3	102
Microstomus kitt	Lemon Sole	5.3	48.8
Lepidorhombus whiffiagonis	Megrim	3.7	13.3

Table A.5.2.3. CPUE indices (nos/hr) by year class of major demersal species Q1 2020

Age	Cod	Haddock	Whiting	Saithe	N. Pout
0	0	0	0	0	0
1	1.44	96	380	0	3697
2	2.9	474	226	0.08	6400
3	1.15	39	71	0.4	54
4	0.98	60	57	2.49	15

5	0.12	16	18	0.75	0
6	0.06	145	11	0.76	0
7	0	0.82	0.82	0.49	0
8	0.04	0.97	0	0.09	0
9	0	0.16	0	0.11	0
10	0	0	0	0.17	0
11	0	0.87	0	0.03	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0

Table A.5.2.4. CPUE indices (nos/hr fishing) of 1-groups of major demersal species since 2011

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cod	0.05	1.4	2	1.1	0.82	0.47	0.29	0.17	1	1.44
Haddock	2.4	14.7	5.2	53	680	56	217	39.8	763	95.8
Whiting	22.2	344	5.5	580	254	323	497	196	323	380
Saithe	0.0	0.0	0.04	0.0	0.0	0.0	0.0	1.28	0	0
N. Pout	173	1012	4238	2136	4649	3245	4370	538	4693	3698

Table A.5.2.5. CPUE indices (kg/hrs fishing) of major demersal species since 2011

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Cod	9.6	21.2	29.3	11.6	72.5	44.1	190	20.4	4.5	10.4
Haddock	149	153	180	114	169	191	325	206	189	198
Whiting	49.3	46.9	63.8	35.0	58.7	96.9	110	100	56	103

Saithe	10.8	6.1	15.2	25.0	24.0	17.1	16.2	42.5	2.18	16
N. Pout	281	131	131	126	65.4	73.9	127	44.1	58.6	165

Table A.5.2.6. Numbers of biological observations per species collected during 0320S. These consist of length, weight, sex and age, unless:

* length, weight, sex, maturity and otoliths retained (to be aged at a later date)

** length, weight, sex, maturity

*** length, weight and age

† length, weight, sex and externally determined maturity only

Species	No.	Species	No.
Melanogrammus aeglefinus	1970	**Scophthalmus maximus	1
Merlangius merlangus	1339	**Scophthalmus rhombus	-
Gadus morhua	174	†Dipturus flossada	6
Pollachius virens	134	†Dipturus intermedia	64
Trisopterus esmarkii	437	†Leucoraja naevus	32
Clupea harengus	573	†Mustelus asterias	15
***Sprattus sprattus	263	†Raja brachyura	12
Scomber scombrus	318	†Raja clavata	197
*Merluccius merluccius	190	†Raja montagui	186
Pleuronectes platessa	65	†Squalus acanthias	103
*Molva molva	63	†Galeorhinus galeus	1

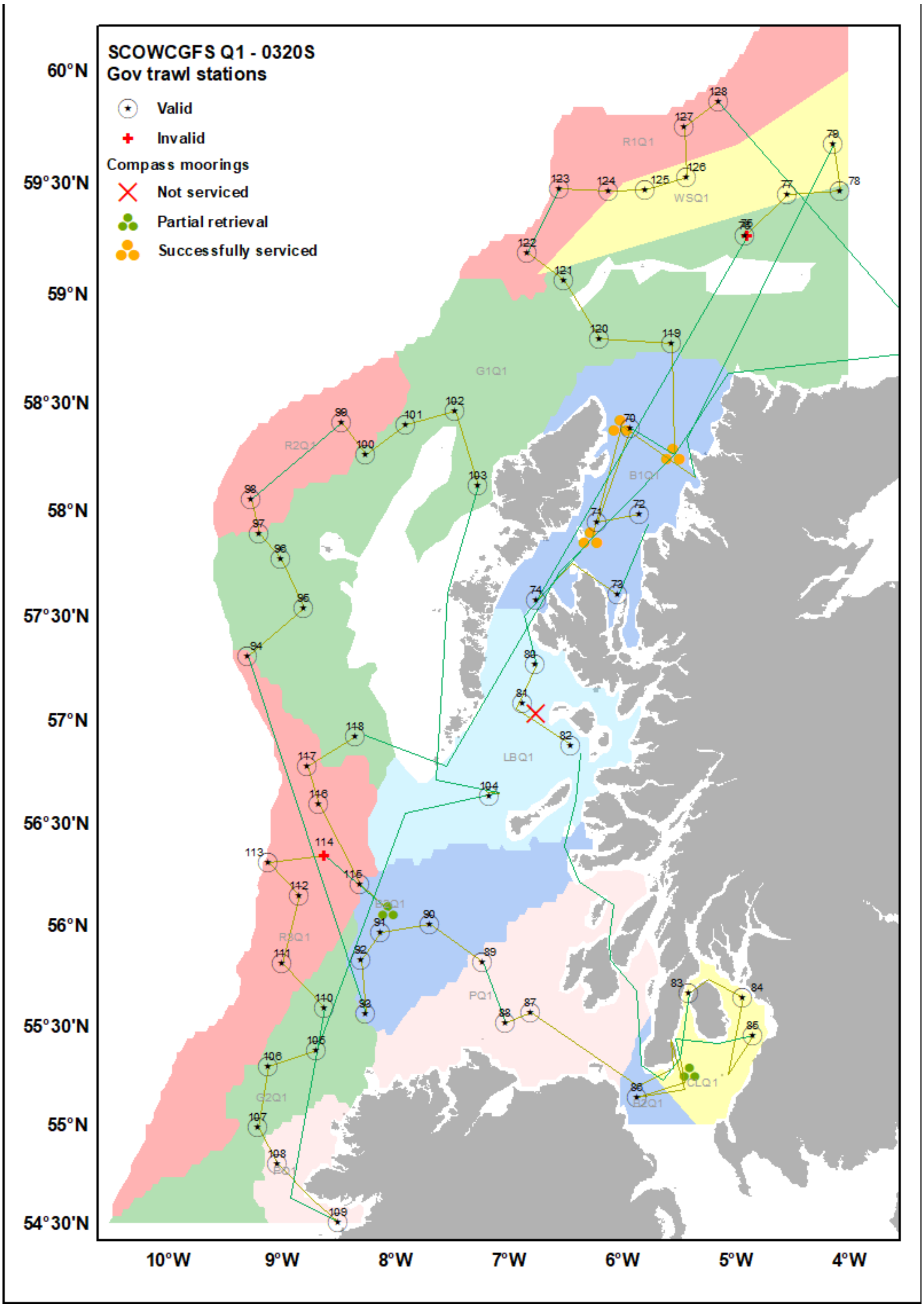

SCOWCGFS Q1 - 0320S
Gov trawl stations
Valid
Invalid
Compass moorings
Not serviced
Partial retrieval
Successfully serviced
60°N
59°30'N
59°N
58°30'N
58°N
57°30'N
57°N
56°30'N
56°N
55°30'N
55°N
54°30'N
10°W
9°W
8°W
7°W
6°W
5°W
4°W
R1Q1
WSQ1
G1Q1
R2Q1
B1Q1
LBQ1
R3Q1
PQ1
G2Q1
CLQ1

Figure A.5.2.1. 0320S survey map showing survey strata (coloured polygons). Valid trawl positions are denoted using black stars in open circles with invalid hauls denoted by a red cross. COMPASS or affiliated moorings deployments are also present.

A.5.3 – Northern Ireland –NI IBTS-Q1 2020

Nation:	**UK-Northern Ireland**	**Ves-sel:**	**Corystes**
Survey:	Groundfish Survey CO1020	Dates:	March 03- March 19, 2020

Cruise	• To obtain information on spatial patterns of abundance of different size-and-age classes of demersal fish in the Irish Sea. • To obtain abundance indices of cod, whiting, haddock and herring for use at ICES Working Groups. • To quantify external parasite loads in whiting and cod by area. • To collect additional biological information on species as required under DCF. • To collect tissue samples for genetics studies on mature cod and hake. • To collect information on the extent of marine littering in the Irish Sea.
Gear details:	A commercial Rockhopper trawl fitted with a 20mm liner in the cod-end was towed over three nautical miles or one nautical mile in the Irish Sea and St George's Channel. Gear and towing procedures were those employed on all previous AFBI groundfish surveys.
Notes from survey (e.g. problems, additional work etc.):	**Demersal Survey** A stratified survey with fixed station positions was employed. The survey was divided into strata defined by length and substratum(see figure A.5.3.1). The species composition of the catch at each station was determined, and length frequencies were recorded for each species. All cod, majority of hake and sub-samples of haddock and whiting were taken for recording length, weight, sex and maturity stages and for the removal of otoliths for ageing. The level of infestation of whiting and cod by external parasites was estimated from biological samples collected at each station. For all hauls fishing was carried out during daylight commencing each day at first light. 57 valid hauls were completed (table A.5.3.1), 21 stations were towed for one hour and 35 stations were 20 minute tows. Stations 79 and 94 were trawled for 2 nm. The width of seabed swept by the trawl doors increased from around 35m in shallow water (30m sounding) to around 45m in deeper water (80m sounding), with variations due to tidal flow. The average headline height was 2.5 – 3.4 m. Trawl parameters were consistent with previous surveys. Cod and whiting taken for biological analysis were screened for external parasites. Trawl data and length frequencies were archived using the newly developed groundfish survey database. Preliminary indices of abundance for 0-group and 1-group cod, whiting and haddock were obtained from the length distributions. More accurate indices will be available once the otoliths collected during the cruise have been aged. Additional Sampling: • All litter picked up in the trawl was classified, quantified and recorded and uploaded to the national MSS litter database from where it will eventually be

	uploaded to DATRAS. The litter was retained onboard for appropriate disposal ashore. • Additional biological data and stomach samples were taken for food web analysis.
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 128 species were recorded during the survey of which 73 were species that were measured for length frequencies. Biological data was recorded for a number of species in accordance with the requirements of the EU Data Regulations. A total of 3,302 biological samples were taken during the survey. See table A.5.3.2

Table A.5.3.1: Number of stations surveyed/gear during CO1020

ICES Divisions	Strata	Gear	Stations Planned	Valid Stations Achieved	Additional Stations	Invalid Stations	% Stations Achieved	Comments
7a		Rockhopper	61	58	0	0	95	

Table A.5.3.2 CO1020 biological sampling.

Data is weight/length/sex/maturity/age except * where age data was not collected, ** where no maturity data collected, ***weight/length/sex.

Species	Nos	Species	Nos
Gadus morhua	136	*Psetta maximus*	0***
Merlangius merlangus	1195	*Raja brachyura*	0***
Melanogrammus aeglefinus	1047	*Raja clavata*	87***
Merluccius merluccius	49*	*Raja montagui*	56***
Pollachius pollachius	2*	*Raja naevus*	0***
Molva molva	0	*Squalus acanthias*	39***
Zeus faber	5	*Microstomus kitt*	128

Scophthalmus rhombus	20	*Lepidorhombus whiffiagonis*	5
Pleuronectes platessa	456	*Chelidonichthys cuculus*	143

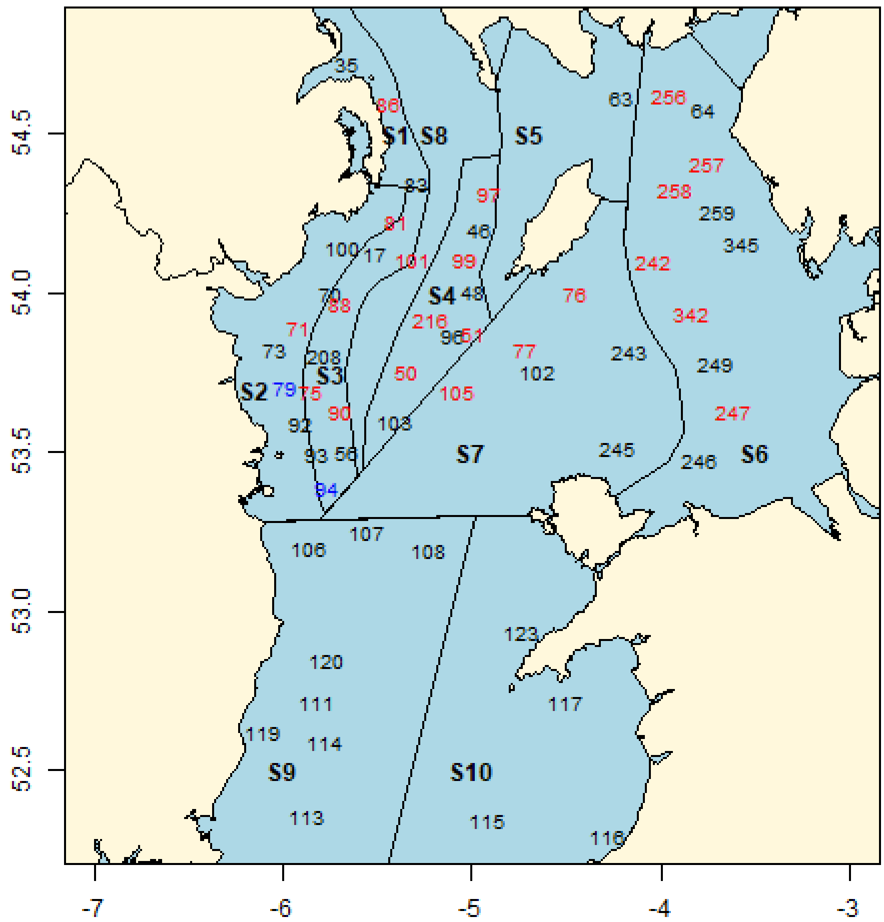


Figure A.5.3.1: - Map of Groundfish Station completed during CO1020. Red stations denote stations towed for 1 hour (3nm), black stations denote stations towed for 20 minutes (1nm) and those coloured blue were towed for 45 minutes (2nm).

A.5.4 - Ireland: Irish Anglerfish and Megrim Survey Q1 – IAMS2020

Nation:	Ireland	Vessel:	Celtic Explorer
Survey:	IAMS	Dates:	23rd Feb– 18th Mar 2020 (VIIb,c,j,k) 12th – 21th April 2020 (VIa)

Cruise	The main objective of the Q1 Irish Anglerfish and Megrim Survey survey is to obtain abundance and biomass indices for anglerfish (*Lophis piscatorius* and *L. budegassa*) megrim (*Lepidorhombus whiffiaginis* and *L. boscii*) in 6a (south of 58°N) and 7 (west of 8°W). Secondary objectives are to collect data on the distribution and relative abundance of anglerfish, megrim and other commercially exploited species. The survey also collects maturity and other biological information for commercial fish species. The Irish Anglerfish and Megrim Survey (IE-IAMS-Q1) data are uploaded to DATRAS. The survey used as a tuning index for mon.27.78abd (WGBIE) and will be submitted for ank.27.78abd and meg.27.78abd for the WKMEGRIM benchmark in 2021-2. Information on the IAMS-Q1 is also included as an annex of the Manual of the IBTS North Eastern Atlantic Surveys, SISP 15 (ICES, 2017).
Gear details:	The trawl is based on a standard commercial otter trawl used in the anglerfish fishery and is described in detail in Reid et al. (IJMS 2007, 64:8 p1503-1511).
Notes from survey (e.g. problems, additional work etc.):	• Operational working hours in April (6a) were reduced from 24 to 12 hours due to comply with Covid-19 restrictions. Staffing levels and targets were reduced proportionally. • 7 full days lost to bad weather in Feb/March; no weather downtime in April; 3 hours of technical downtime • Additional deep water transects (500-1,500m) were added to survey protocols (3 additional days have been added to legs 1 and 2 to facilitate this work). This work is funded independently through EMFF.
Number of fish species recorded and notes on any rare species or unusual catches:	In 2020, 79 species of teleosts, 30 species of elasmobranchs, 7 species of cephalopods and 37 other species/groups were recorded. The following unusual species were recorded: Polymetme corythaeola; Gaidropsarus macrophthalmus; Bathyraja pallida; Torpedo torpedo; Aldrovandia affinis.

Table A.5.4.1 Stations fished (aim to complete 115 valid tows per year)

ICES Divisions	Strata	Valid Tows	Stratum area (km^2)	Swept area (km^2)
6a	VIa_Shelf_L	7	37,003	3.0
6a	VIa_Shelf_M	7	4,746	4.2
6a	VIa_Slope_H	6	3,114	3.7

6a	VIa_Slope_M	5	3,044	3.1
7bcjk	VII_Shelf_H	15	50,764	8.2
7bcjk	VII_Shelf_L	21	42,034	11.2
7bcjk	VII_Shelf_M	5	14,621	2.7
7bcjk	VII_Slope_H	21	35,768	12.5
		5		
7bcjk	VII_Slope_M		29,406	3.0
6a	DeepArea4	(3)	Additional Sampling	
7c	DeepArea5	(3)	Additional Sampling	
	TOTAL	92+(6)	220,500	52

Table A.5.4.2 Biological samples (length, weight, sex, maturity and age material); maturty* (lengh, weight, sex and maturity); length weight only (length and weight).**

Number of biological samples (maturity and age material, *maturity only):			
Species	No.	Species	No.
*Dipturus flossada**	65	*Molva molva*	188
*Dipturus intermedia***	123	*Pleuronectes platessa*	216
Gadus morhua	51	*Pollachius pollachius*	32
*Glyptocephalus cynoglossus***	355	*Pollachius virens*	55
*Lepidorhombus boscii***	179	*Psetta maxima***	2
Lepidorhombus whiffiagonis	581	*Raja brachyura**	1
*Leucoraja naevus**	386	*Raja clavata**	220
Lophius budegassa	479	*Raja montagui**	256
Lophius piscatorius	862	*Scophthalmus rhombus***	3
Melanogrammus aeglefinus	612	*Solea solea*	6
Merlangius merlangus	265	*Squalus acanthias**	413
*Merluccius merluccius***	1359	*Zeus faber***	144
*Microstomus kitt***	210		

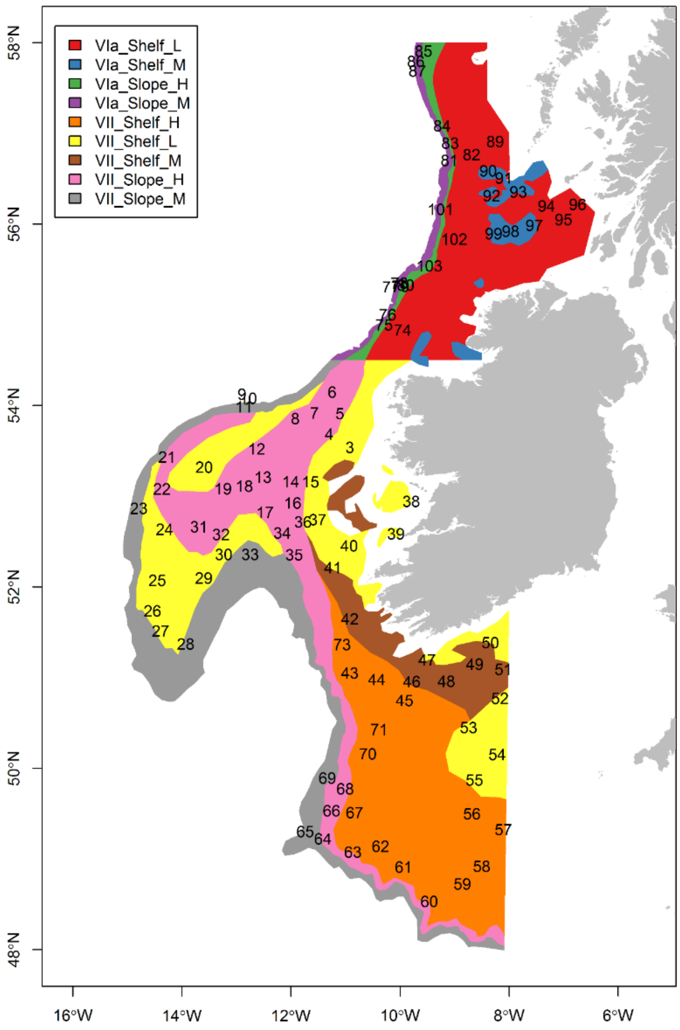


Figure A.5.4.1 - Map of valid survey stations completed by the Irish Anglerfish and Megrim Survey in 2020. The numbers refer to the haul number.

Table A.5.4.3 Table Summary statistics by stratum. Stratum area is given in Km², Num hauls is the is the number of valid hauls in each stratum and Swept area is the total area swept between the doors in each stratum (in Km2), catch numbers are given for *L. piscatorius* (MON), *L. budegassa* (WAF), *L. whiffiagonis* (MEG) and *L. boscii* (Lbi).

Stratum	Stratum area	Num hauls	Swept area	CatchNum MON	CatchNum WAF	CatchNum MEG	CatchNum LBI
VIa_Shelf_L	37,003	7	3.0	28	3	18	0
VIa_Shelf_M	4,746	7	4.2	55	99	76	0
VIa_Slope_H	3,114	6	3.7	183	43	349	10
VIa_Slope_M	3,044	5	3.1	89	1	14	0
VII_Shelf_H	50,764	15	8.2	67	136	188	25
VII_Shelf_L	42,034	21	11.2	128	71	55	75

VII_Shelf_M	14,621	5	2.7	25	34	22	0
VII_Slope_H	35,768	21	12.5	171	118	169	111
VII_Slope_M	29,406	5	3.0	18	1	5	2
Total	**220,500**	**92**	**52**	**764**	**506**	**896**	**223**

Table A.5.4.4 - Estimated numbers (millions) and biomass (kT) in the survey area, with CV and confidence intervals (CIlo and CIhi). Only fish >500g live weight (approximately 32cm) were included in the estimate.

	L piscatorius		*L budegassa*	
	VIa	**VII**	**VIa**	**VII**
NumMln	3.043	7.489	0.968	10.581
NumCV	20.722	10.471	22.887	20.442
NumCIlo	1.807	5.952	0.534	6.342
NumCIlo	4.278	9.026	1.402	14.821
BiomKT	3.647	17.802	0.665	7.314
BiomCV	20.269	11.947	25.482	12.247
BiomCIlo	2.198	13.634	0.333	5.558
BiomCIlo	5.096	21.971	0.997	9.069

A.5.5 – Spain – SP GCGFS Q1 2020

NATION:	SP (SPAIN)	VESSEL:	MIGUEL OLIVER
Survey:	SP-GCGFS-Q1 (ARSA 0320)	Dates:	18 February - 03 March 2020
Cruise	Spanish Gulf of Cadiz bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in the Gulf of Cadiz area (ICES Division 9a). The primary species are hake, horse mackerel, wedge sole, sea breams, mackerel and Spanish mackerel. Data and abundance indices are also collected and estimated for other demersal fish species and invertebrates as rose and red shrimps, Nephrops and cephalopod molluscs.		
Survey Design	The survey is random stratified with 5 depth strata (15-30 m, 31-100 m, 101-200 m, 201-500 m, 501-800 m). Stations are allocated at random according to the strata surface.		
Gear details:	Baca 44/60 with Thyborøn doors (350 Kg).		
Notes from survey (e.g. problems, additional work etc.):	Hydrographic data at each trawl station was collected using a net-mounted CTD. Additionally, 15 beam trawl stations were carried out. Analyses of stomach contents of main demersal species was performed during the survey.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 147 fish species, 49 crustaceans and 56 molluscs were recorded.		

Table A.5.5.1 - Stations fished (aim: to complete 45 valid tows per year)

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	VALID	ADDITIONAL	INVALID	% STATIONS FISHED	COMMENTS
9a	All	Baca 44/60	45	45	-	-	100%	
	TOTAL		45	45	-	-	100%	

Table A.5.5.2 – Biological samples (length, weight, sex, maturity and age material)

SPECIES	AGE	SPECIES	AGE
Merluccius merluccius	252	*Sepia officinalis**	158
*Merluccius merluccius**	1890	*Octopus vulgaris**	87
*Parapenaeus longirostris**	1884	*Loligo vulgaris**	160
*Nephrops norvegicus**	773	*Nephrops norvegicus***	552

(*) Maturity only

(**) Tagging

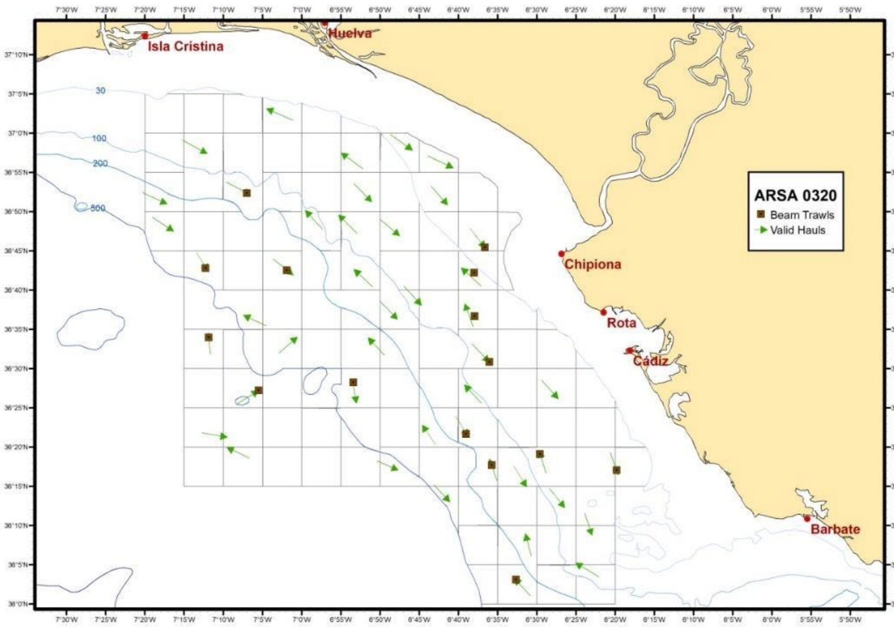


Figure A.5.5.1 - Trawl stations in Q1 Gulf of Cadiz 2020 survey.

Table A.5.5.2 – Biomass and abundance estimates for ARSA 0320

BIOMASS AND NUMBER ESTIMATES								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/$ $y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/$ $y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	All	45	2.91	13.3	5.0	35.5	-45.2	2.0
Micromesistius poutassou	All	45	0.22	-98.1	-58.8	2.2	-98.7	-82.3
Nephrops norvegicus	All	45	1.26	356.4	135.4	65.9	752.1	196.9
Parapenaeus longirostris	All	45	0.99	-61.0	297.4	150.3	-73.1	283.4
Octopus vulgaris	All	45	0.59	-69.5	57.5	0.9	-73.7	65.1
Loligo vulgaris	All	45	0.58	210.8	24.6	2.4	195.0	-56.2
Sepia officinalis	All	45	0.68	-63.5	102.5	1.9	-65.3	113.3

y_i, year estimate (2020); $\mathbf{y_{i-1}}$, previous year estimate (2019); $\mathbf{y_{(i,i-1)}}$, Average of last two year estimates (2020 and 2019); $\mathbf{y_{(i-2,i-3,i-4)}}$, Average of the previous three year estimates (2018, 2017 and 2016).

A.5.6 – Scotland – SCOROC Q3 2020

Nation:	Scotland	Vessel:	Scotia
Survey:	1320S (Rockall Haddock)	Dates:	10th – 22nd September 2020

Cruise:	Q3 Rockall 2020 survey aims to: • Collect data on the distribution, relative abundance and biological information (EU Data Directive 1639/2001) on haddock *Melanogrammus aeglefinus* and a range of other fish species in ICES areas VIb. • Obtain temperature and salinity data from the surface and near seabed at selected trawling stations • Collect additional biological data in connection with the EU data collection framework (DCF). • To deploy an array of three marine mammal / underwater noise acoustic monitoring moorings on behalf of the EU INTERREG VA funded COMPASS at a pre-selected site in the Rockall Haddock Box (RHB).
Gear details:	Strengthened GOV incorporating ground-gear D and 97m sweeps was used at all stations. The following parameters were recorded during each tow using Scanmar hardware and vessel's own navigation system: headline height, wing spread, door spread, speed over the ground and distance covered. A bottom contact sensor was attached to the ground-gear and downloaded each tow to monitor contact with the seabed.
Notes from survey (e.g. problems, additional work etc.):	The survey design since 2011 has been random-stratified with primary trawl locations randomly distributed within 4 sampling strata. a defined by depth contour: 0-150m, 150-200m, 200-250m, 250-350m. Trawls were undertaken within a radius of 5 nautical miles to the specified sampling position and as near to the actual point as was practicable. If for any reason the trawl could not be undertaken at the primary site then a replacement was taken from a list of secondary random positions. There were 40 valid trawls completed (Table A.5.6.1) with all fishing taking place during daylight hours. There were a further 2 trawls considered foul (heavy damage) or invalid (<15min duration). Figure A.5.6.1 displays sampling strata, trawl locations and haul numbers. This year haddock recruitment stands out as very strong being observed spread throughout the upper bank but particularly noticeable over the northern end of the survey area. This represents the second highest recruitment since the new survey design of 2011 and a marked improvement on that of the previous two years (Figure A.5.6.2). The CPUE of 1-2 year old haddock was moderate and more evenly distributed over the bank. CPUE for haddock > 4 years old were however low (Table A.5.6.3). Ages were recorded for haddock, whiting (*Merlangius merlangius*), cod (*Gadus morhua*) and mackerel (*Scomber scombrus*) along with sex, and weight data. Data on other species sampled for biological information are summarised in Table A.5.6.4 CTD casts (n=18) were made at selected stations to give a representative coverage of the bank over the depth range surveyed.

	Demersal otoliths were aged at sea, pelagic otoliths were aged back at the marine lab. Deployment of acoustic monitoring moorings went according to plan with two of the moorings (C1, 286m depth and C3, 233m depth) were deployed in UK waters while one (C2, 286m depth) was deployed in Irish waters (Figure A.5.6.1). All litter picked up in the trawl was classified, quantified and recorded then retained for appropriate disposal ashore. Miscellaneous samples collected: • Anglerfish (L. piscatorius): 25 sets of complete internal organs were frozen to support an MSc project (MSS/University of Aberdeen) studying parasite load in anglerfish as population markers. • Axinellid sponges: Tissue samples from 55 specimens of mainly *Phakellia ventilabrum* and *Axinella infundibuliformis* were collected for phylogenetic study (Natural History Museum). • All shelled molluscs were retained frozen for the Mackay reference collection.
No. fish species recorded and notes on any rare species or unusual catches:	Overall a total of 47 species were caught during the survey for a total catch weight of ~21.9 tonnes recorded from 18.2 hrs of combined trawl time. Amongst the combined catch Norway redfish (*Sebastes viviparus*, ~6.6 tonnes overall), blue whiting (*Micromesistius poutassou*, ~6.2 tonnes overall).and haddock (~5.2 tonnes overall) were prominent and this is reflected in the relative CPUE of the most common species (Table A.5.6.2) Few cod (~39kg overall) and zero saithe (*Pollachius virens*) were caught this year. Very small amounts of whiting (~0.9kg overall) were observed, all of them being 0-group fish (Table A.5.6.3). Low levels of mackerel were encountered (~17.3kg overall).

Table A.5.6.1. Number of stations surveyed - 1320S.

ICES Division	Strata	Gear	Stations Planned	Valid Stations Achieved	Additional Stations	Invalid Stations	% Stations Achieved	Comments
VIb	All	GOV-D	40	40	-	2	100	

Table A.5.6.2. CPUE data (all strata combined) for major species caught during 1320S.

Species	CPUE no's/h	CPUE kg/h
Sebastes viviparus	361	6772
Micromesistius poutassou	342	10154
Melanogrammus aeglefinus	289	5049
Helicolenus dactylopterus	57.9	1184

Argentina sphyraena	37.7	583
Eutrigla gurnardus	18.6	76
Trisopterus minutus	17.2	234
Ammodytes marinus	16.6	1380
Dipturus flossada	15.1	3.4
Lepidorhombus whiffiagonis	10.1	48.7
Lophius piscatorius	9.1	3.1
Molva molva	7.5	1.3
Microstomus kitt	4.3	43
Gadiculus argenteus	3.9	261
Raja clavata	3	1.5
Gadus morhua	2.2	0.4

Table A.5.6.3. Rounded CPUE indices (no. per 10 hrs fishing) by age for Rockall haddock 2020 plus that of other major commercial species.

Age	Haddock No./10 hr.	Cod No./10 hr.	Saithe No./10 hr.	Whiting No./10 hr.
0	25149	0	0	9.4
1	1457	0	0	0
2	2114	1.2	0	0
3	774	0.9	0	0
4	1700	0.6	0	0
5	39.6	0	0	0
6	52.6	0	0	0
7	51.3	0	0	0
8	40.5	0	0	0
9	2.7	0	0	0

10	0	0	0	0

Table A.5.6.4. Numbers of biological observations per species collected during 1320S. Data is weight/length/sex/maturity/age except * where age data was not collected.

Species	Biodata	Species	Biodata
Gadus morhua	*7*	*Dipturus flossada*	*60**
Melanogrammus aeglefinus	*1397*	*Dipturus oxyrinchus*	*1**
Merlangius merlangus	*17*	*Leucoraja fullonica*	*3**
Scomber scombrus	*18*	*Raja clavata*	*28**

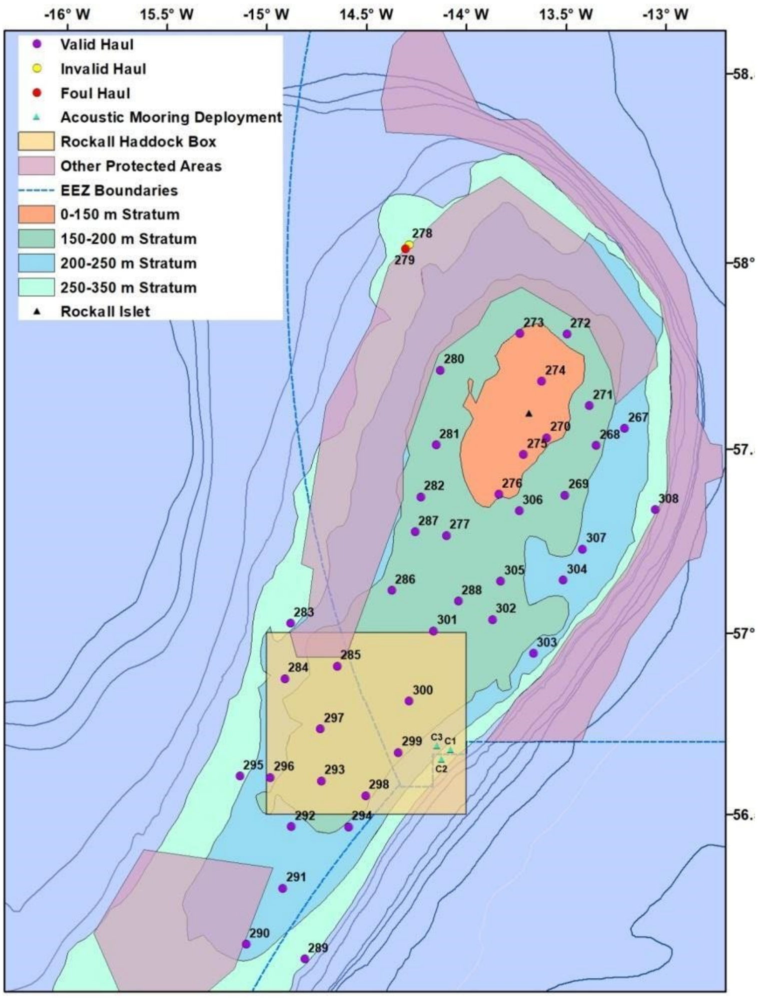


Figure A.5.6.1. Survey strata, NEAFC closed areas and trawl positions along with haul numbers of stations and acoustic mooring deployment positions completed at Rockall during 1320S.

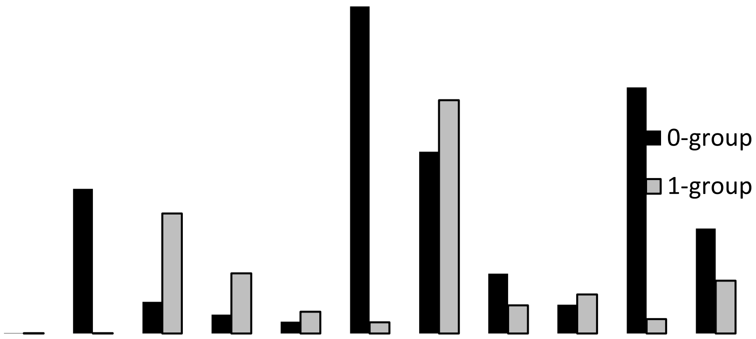


Figure A.5.6.2. Index of 0 and 1-group haddock at Rockall in 2020 shown relative to the previous years and the average since 2011 (beginning of new survey design).

A.5.7 – Spain – SP-PORC- Q3 2020

NATION:	SP (SPAIN)	VESSEL:	VIZCONDE DE EZA
Survey:	SP-PORC-Q3 (Porcupine 20)	Dates:	16 September - 19 October 2020
Cruise	Spanish Porcupine bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in Porcupine bank area (ICES Division 7b-k). The primary target species are hake, monkfish, white anglerfish and megrim, which abundance indices are estimated by age, with abundance indices also estimated for Nephrops, four-spot megrim and blue whiting. Data collection is also carried out for several other demersal fish species and invertebrates.		
Survey Design	The survey is random stratified with two geographical strata (northern and southern) and 3 depth strata (170-300 m, 301-450 m, 451-800 m). Stations are allocated at random according to the strata surface.		
Gear details:	Porcupine Baca 39/52 with Polyvalent doors.		
Notes from survey (e.g. problems, additional work etc.):	Weather conditions were poor, especially on the first leg of the survey. Standard tow duration was 20 minutes from gear ground contact, as implemented five years ago (2016). Additional work undertaken included 7 additional deep tows (> 800 m) on the eastern margin of the study area, 102 CTD casts, at most trawl stations, 3 within the non-trawlable area, and 8 in four radials perpendicular to the bank limits.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 18 fish species, 56 crustaceans, 37 molluscs, 39 echinoderms and 49 species of other invertebrates were identified.		

Table A.5.7.1 - Stations fished (aim: to complete 80 valid tows per year)

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	VALID	ADDITIONAL	INVALID	% STATIONS FISHED	COMMENTS
7b-k	All	Porcupinebaca	80	80	11	9	100%	
	TOTAL		80	80	11	9	100%	

Table A.5.7.2 - Biological samples (length, weight, sex, maturity and age material)

SPECIES	AGE	SPECIES	AGE
Merluccius merluccius	635	*Molva molva*	5
Lepidorhombus whiffiagonis	889	*Conger conger***	34
Lepidorhombus boscii	563	*Helicolenus dactylopterus*	208
Lophius budegassa	19	*Phycis blennoides*	264
Lophius piscatorius	168	*Scomber scombrus*	9
*Nephrops norvegicus**	157		

(*) Maturity only.

(**) Otoliths and vertebrae.

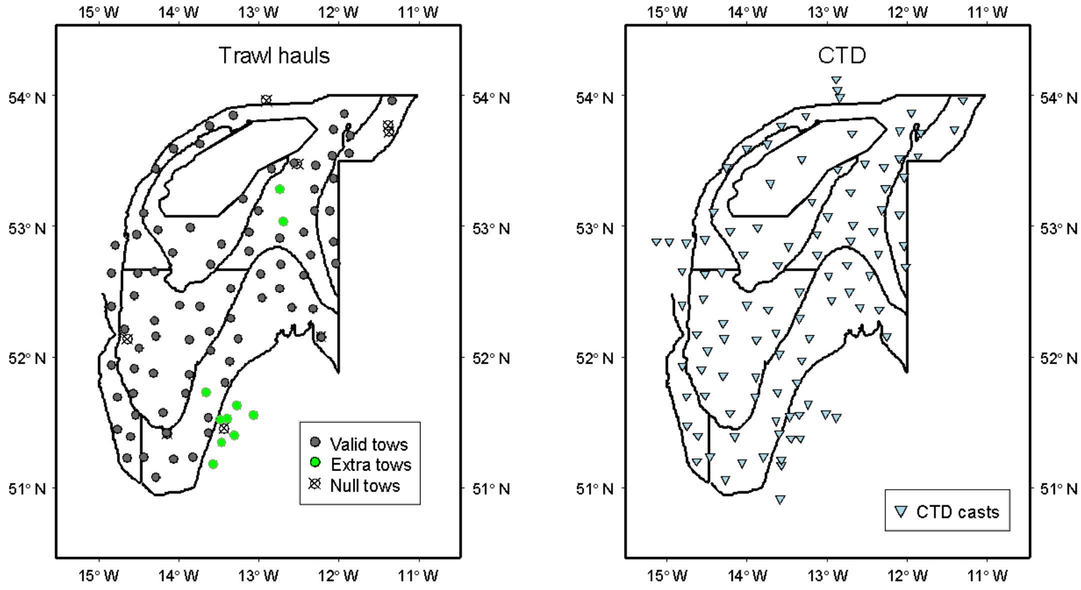


Figure A.5.7.1 a) Trawl stations in Spanish Porcupine 2020 survey and b) CTD .

Table A.5.7.3 - Biomass and abundance estimates for Porcupine 20

BIOMASS AND NUMBER ESTIMATES								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	All	80	27.50	-11.6	-33.9	32.8	-15.7	-47.6
Lepidorhombus whiffiagonis	All	80	12.63	-7.4	-1.6	181.0	-11.8	-3.7
Lepidorhombus boscii	All	80	9.96	-29.2	4.9	104.2	-30.5	9.7
Lophius budegassa	All	80	0.78	-33.9	0.7	0.3	-67.1	-23.0
Lophius piscatorius	All	80	15.59	-5.7	-12.2	3.4	-17.9	-27.2
Micromesistius poutassou	All	80	875.86	79.1	34.5	13258.2	188.3	64.5
Nephrops norvegicus	All	80	0.84	-64.3	-18.5	24.7	-67.3	-35.5

y_i, year estimate (2020); y_{i-1}, previous year estimate (2019); $y_{(i,i-1)}$, Average of last two year estimates (2020 and 2019); $y_{(i-2,i-3,i-4)}$, Average of the previous three year estimates (2018, 2017 and 2016).

A.5.8 - Scotland –SCOWCGFS-Q4 2020

Nation:	**Scotland**	**Vessel:**	**Scotia**
Survey:	1820S (SCOWCGFS- Q4)	Dates:	16 November– 8 December 2020

Cruise	Objectives of SCOWCGFS – Q4: • Demersal trawling survey (SCOWCGFS-Q4) of the grounds off the north and west of Scotland and Ireland in ICES Subarea 6a and 7b. • To obtain temperature and salinity data from the surface and seabed at each trawling station. • Collect additional biological data in connection with the EU Data Collection Framework (DCF). • Retrieval and re-deployment of COMPASS project moorings located at discrete sites within the trawl survey area (2 additional days added to the survey).
Gear details:	GOV incorporating groundgear D was used at all stations and was deployed on 63 occasions (see table A.5.8.1). Sweeps were 97m in all cases where the mean depth was >80m (n=51), otherwise 47m sweeps were used (n=12). The following parameters were recorded during each haul using SCANMAR: headline height, wing spread, door spread and distance covered. A bottom contact sensor was attached to the groundgear and downloaded following each haul to aid validation of touchdown and lift off times for trawl.
Notes from survey (e.g. problems, additional work etc.):	The extreme weather encountered during the long first half of the survey undoubtedly had an impact on the progress made and specifically regarding transit time between trawl stations, that said Scotia was still able to complete all the stations west of the Hebrides and down towards the Donegal Coast during this first sweep. The very narrow operational daylight window at this time of year makes it virtually impossible to complete all the trawl stations within the daylight period, however in excess of 80% of the core stations (out of a total of 93% successfully completed overall) were nevertheless completed during daylight. Coupled with an overall 90% success rate with regards to the COMPASS moorings objective and the survey can be considered to have been overwhelmingly successful in meeting all of its objectives. This was despite losing approximately 2 days to weather as well as the operation to safely remove a WW2 Geomagnetic mine from Scotia's trawl deck whilst surveying in the Clyde which also cost Scotia an additional survey day. The GOV (BT137) was deployed on 63 occasions with short 47m sweeps where the seabed depth was 80m or less being deployed on 12 occasions (10 valid +2 invalid hauls), the long 97m sweeps being utilised on the remaining 51 deeper hauls (46 valid standard hauls +5 invalid hauls). Of the 56 valid hauls completed 49 of these were completed during daylight hours. There were 7 foul/invalid hauls. 2 were invalidated due to the kite being fouled during shooting (haul 376) and also the presence of the live WW2 mine trawled up in the Firth Of Clyde during haul 425. The remaining 5 foul hauls were attributable to damage sustained to the gear whilst trawling (hauls: 389, 400, 408, 420 and 435). Two of those occasions required the entire trawl to be changed over. This was at least partly to minimise impact on the wider survey and the narrow operational daylight window. The locations used for the valid trawl positions during this survey were a combination of

	established MSS survey tows, commercial trawled areas and also completely new tows. On 12 occasions grounds were successfully utilised that previously were unfished by MSS. See figure A.5.8.1 for plot of all survey tows.
Number of fish species recorded and notes on any rare species or unusual catches:	**Catch Results** *(2019 results presented in italics)* A total of 89 species were recorded for an overall catch weight of ~26.35 tonnes (99, 28.14). Major species components in approximate tonnes included: haddock *Melanogrammus aeglefinus* – 7.03 (6.93), mackerel *Scomber scombrus* – 0.56 (2.03), cod *Gadus morhua* – 0.26 (0.18) Norway pout *Trisopterus esmarkii* – 0.76 (2.51), whiting *Merlangius merlangus* – 1.92 (2.19), herring *Clupea harengus* – 0.08 (0.89), and horse mackerel*Trachurus trachurus* – 4.1 (3.5). Overall, catches of the larger gadoid species (cod, haddock and whiting) in Q4 2020 were almost identical to Q4 2019 although worth noting that saithe was virtually absent (11 fish, 16kgs) and cod catches across the survey are still very low at just over 200kgs for the entire survey. There was a notable and significant decrease in catches of herring, mackerel and Norway Pout encountered during the 2020 survey compared to catches reported from the same survey in 2019. For herring this marks a record survey low with an overall catchweight of only 82 kilograms. Mackerel and Norway Pout in 2020 were both down by over 60% on the 2019 catch-weights in which the overall effort was almost identical to this year. Also of interest only very low numbers of juvenile mackerel were reported from stations completed within subarea 7b. This stratum covers the southern half of Donegal Bay as well as the inshore areas along the Sligo coast and has in the past been an important nursery area for juvenile mackerel. Table A.5.8.2 provides overall catch rates per unit effort (CPUE) of the above species and several other major species. The CPUE index (numbers caught per hour fishing) for 1-group gadoids (cod, haddock, whiting, saithe and Norway Pout) weights the indices for each of the 11 relevant 6a sampling strata by the surface area of said strata. These are then pooled to produce the index for ICES Subarea 6a. Results for all age classes of the major commercial gadoid species are shown in table A.5.8.3 while those of 1-groups only for period 2014-2020 are shown in table A.5.8.4. Overall the survey CPUE indices recorded a decrease in the 1- group abundance estimates for almost all target species with only whiting showing a modest increase compared to 2019. Numbers of 1 group haddock are over 50 percent down from last year estimate albeit that was unusually high. The situation with Norway Pout is even more marked with an over 80 percent decrease compared to 2019 although was a survey record. Cod and saithe continue to deliver only very low numbers for these species at all age groups. During this survey no 1- group saithe were recorded during the survey. Notable and novel species encountered during the survey included 2 streaked gurnards (*Trigloporus lastoviza*) that were recorded from haul 410 and NW of Donegal and a spiny lobster (*Palinurus elephas*) that was recorded and subsequently returned alive from station 418 and also NW of Donegal. **Biological Sampling** In total 5303 biological observations on selected species were collected including a number collected in support of EU Data Collection Framework (DCF). A summary of numbers collected for all species is displayed in Table A.5.8.5.

	Marine Litter All litter picked up in the trawl was classified, quantified, recorded and retained for appropriate disposal ashore. The data is uploaded to the MSS database from where it will eventually be uploaded to DATRAS. **Monitoring of Non Indigenous Invasive Species (NIS)** All catches were screened for the presence of selected NIS species with the results being reported back to the project coordinator at CEFAS.

Table A.5.8.1 - Numbers of stations fished

ICES Divisions	Strata	Gear	Stations Planned	Valid Stations Achieved	Additional Stations	Invalid Stations	% Stations Achieved	Comments
VIa	11	GOV-D	58	53	0	7	91	Severe weather
VIIb	1	GOV-D	4	3	0	0	75	

Table A.5.8.2 - Overall CPUE of major components of combined catch Q4 2020

Species	Common name	kg/h	no/hr
Melanogrammus aeglefinus	Haddock	258.8	1036
Scomber scombrus	Mackerel	20.7	141
Gadus morhua	Cod	9.7	5.2
Trisopterus esmarkii	Norway Pout	28	1963
Merlangius merlangus	Whiting	70.6	809
Clupea harengus	Herring	3	38
Trachurus trachurus	Horse Mackerel	150	806
Scyliorhinus canicula	Lesser Spotted Dogfish	36.4	71
Pleuronectes platessa	Plaice	2.2	8.5
Eutrigla gurnardus	Grey Gurnard	5.2	59
Capros aper	Boar Fish	136	4142
Squalus acanthias	Spurdog	52	36
Pollachius virens	Saithe	0.6	0.4
Merluccius merluccius	Hake	14.9	60
Dipturus intermedia	Flapper Skate	9.8	1.5
Loligo sp.	Long Finned Squid	11.6	66.9
Raja montagui	Spotted Ray	8.3	11.2
Lophius piscatorius	Angler	2.1	2.2
Sprattus sprattus	Sprat	0.4	55
Raja clavata	Thornback Ray	5	3.9
Chelidonichthys cuculus	Red Gurnard	8	29
Micromesistius poutassou	Blue Whiting	87	3684
Limanda limanda	Common Dab	2.9	35.5
Microstomus kitt	Lemon Sole	2.2	16.4

Lepidorhombus whiffiagonis	Megrim	2.3	8.7

Table A.5.8.3 - CPUE indices (nos/hr) by year class of major demersal species Q4 2020

Age	Cod	Haddock	Whiting	Saithe	N. Pout
0	0.0601	187.853	306.0365	0	1676.423
1	1.5988	290.3194	239.2213	0	296.8977
2	2.4873	417.1229	84.1914	0.3085	148.3703
3	0.3472	41.3221	23.0754	0	1.1805
4	0.4936	49.1395	16.0965	0	0
5	0.135	15.9892	3.8384	0.0392	0
6	0.0783	97.1752	0.9817	0	0
7	0.0392	1.244	0.0713	0	0
8	0	0.0807	0	0.0392	0
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0.0392	0	0	0
12	0	0	0	0	0
13	0	0	0	0	0
14	0	0	0	0	0
15	0	0	0	0	0
16	0	0	0	0	0

Table A.5.8.4 - CPUE indices (nos/hr fishing) for Q4 1-groups of major demersal species since 2014

Species	2014	2015	2016	2017	2018	2019	2020
Cod	2.37	2.82	0.62	1	0.457	1.765	1.599
Haddock	67.87	995.6	93.55	168.8	98.91	627.5	290.3
Whiting	151.8	279.4	241.5	294.3	50.25	195.5	239.2
Saithe	0.004	0.5	0.06	0	0.036	0.083	0
N. Pout	267	1481	1227	48.7	96.76	1797	296.9

Table A.5.8.5. Numbers of biological observations per species collected during 1820S. These consist of length, weight, sex, age unless:
*** length, weight, sex, and otoliths retained (to be aged at a later date)**
**** length, weight, sex**
***** length, weight and age**
****** length, weight, sex, maturity and age**
† length, weight, sex and externally determined maturity only

Species	No.	Species	No.
Melanogrammus aeglefinus	*1869*	***Scophthalmus maximus*	*4*
Merlangius merlangus	*1114*	***Scophthalmus rhombus*	*1*

Gadus morhua	*139*	*†Dipturus flossada*	*11*
Pollachius virens	*10*	*†Dipturus intermedia*	*30*
Trisopterus esmarkii	*438*	*†Leucoraja naevus*	*34*
*****Clupea harengus*	*202*	*†Mustelus asterias*	*6*
*****Sprattus sprattus*	*156*	*†Raja brachyura*	*3*
*****Scomber scombrus*	*245*	*†Raja clavata*	*90*
**Merluccius merluccius*	*158*	*†Raja montagui*	*230*
Pleuronectes platessa	*127*	*†Squalus acanthias*	*158*
**Molva molva*	*45*	*†Galeorhinus galeus*	*5*
Lophius piscatorius	*46*	*Lophius budegassa*	*14*
***L. bosci*	*2*	***Pollachius pollachius*	*2*
**L. whiffiagonis*	*133*	*G. cynoglossus*	*32*

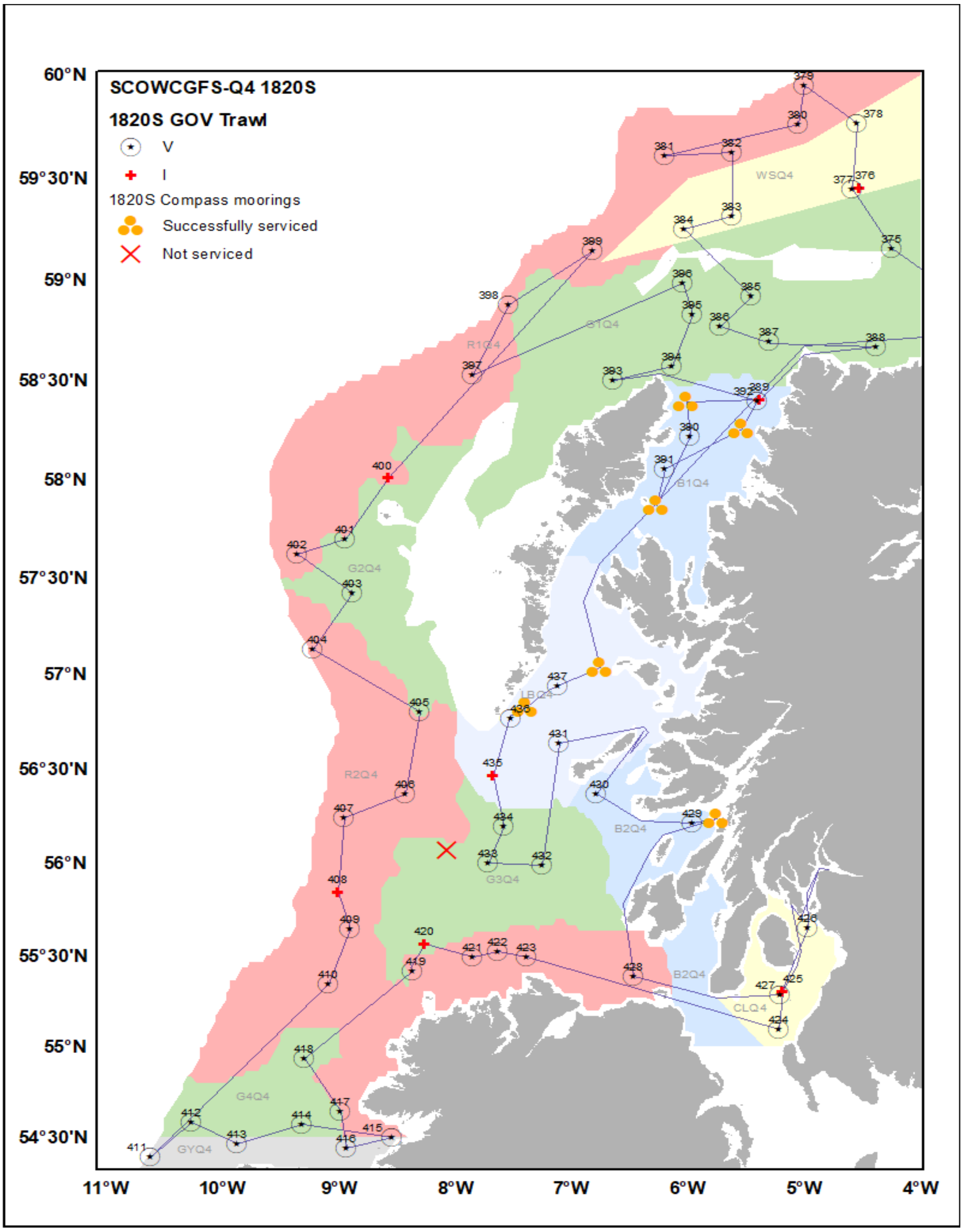


Figure A.5.8.1. 1820S survey map showing survey strata (coloured polygons), trawl and COMPASS mooring deployments. Also shown is the survey track taken.

A.5.9 – Northern Ireland – NI IBTS Q4 2020

Nation:	Northern Ireland	Vessel:	Corystes
Survey:	Groundfish Survey CO4120	Dates:	04 – 23 October 2020

Cruise	Objectives: • To obtain information on spatial patterns of abundance of different size-and-age classes of demersal fish in the Irish Sea. • To obtain abundance indices of cod, whiting, haddock and herring for use at ICES Working Groups. • To quantify external parasite loads in whiting and cod by area. • To collect additional biological information on species as required under DCF. • To collect tissue samples for genetics studies on mature cod and hake. • To collect information on the extent of marine littering in the Irish Sea. • Collect 15 fish samples for reverse ring test organized by Thomson Unicomarine Ld, recording species, length and station. • To collect stomachs and fish samples from target species list for analysis of food webs.
Gear details:	A commercial Rockhopper trawl fitted with a 20mm liner in the cod-end was towed over three nautical miles or one nautical mile in the Irish Sea and St George's Channel. Gear and towing procedures were those employed on all previous AFBI groundfish surveys.
Notes from survey (e.g. problems, additional work etc.):	A stratified survey with fixed station positions was employed. The survey was divided into strata defined by length and substratum. The species composition of the catch at each station was determined, and length frequencies were recorded for each species. All cod, majority of hake and sub-samples of haddock and whiting were taken for recording length, weight, sex and maturity stages and for the removal of otoliths for ageing. The level of infestation of whiting and cod by external parasites was estimated from biological samples collected at each station. For all hauls fishing was carried out during daylight commencing each day at first light. 58 valid hauls were completed, one haul was repeated. All tows were 20 minutes. The width of seabed swept by the trawl doors increased from around 35m in shallow water (30m sounding) to around 45m in deeper water (80m sounding), with variations due to tidal flow. The average headline height was 2.5 – 3.1 m. Trawl parameters were consistent with previous surveys. Cod and whiting taken for biological analysis were screened for external parasites. Trawl data and length frequencies were archived using the newly developed groundfish survey database. Preliminary indices of abundance for 0-group and 1-group cod, whiting and haddock were obtained from the length distributions. More

	accurate indices will be available once the otoliths collected during the cruise have been aged. Additional Sampling: All litter picked up in the trawl was classified, quantified and recorded and uploaded to the national MSS litter database from where it will eventually be uploaded to DATRAS. The litter was retained onboard for appropriate disposal ashore.
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 123 species were recorded during the survey of which 73 were measured for length frequencies. Biological data was recorded for a number of species in accordance with the requirements of the EU Data Regulations. A total of 2,740 biological samples were taken during the survey.

Table A.5.9.1 - Number of stations fished during CO4120

ICES Divisions	Strata	Gear	Stations planned	Valid stations	Additional stations	Invalid stations	stations achieved (%)	Comments
7a		Rockhopper	62	58	0	0	93	

Table A.5.9.2 - CO4120 biological sampling. Data is weight/length/sex/maturity/age except * where age data was not collected, ** where no maturity data collected, ***weight/length/sex.

Species	Nos	Species	Nos
Gadus morhua	20	*Microstomus kitt*	16
Merlangius merlangus	1100	*Lepidorhombus whiffiagonis*	6
Melanogrammus aeglefinus	784	*Chelidonichthys cuculus*	72
Merluccius merluccius	55	*Psetta maximus*	1
Pollachius pollachius	1	*Raja brachyura*	43***
Molva molva	0	*Raja clavata*	150***
Zeus faber	9	*Raja montagui*	65***
Scophthalmus rhombus	8	*Raja naevus*	0***
Pleuronectes platessa	317	*Squalus acanthias*	78***

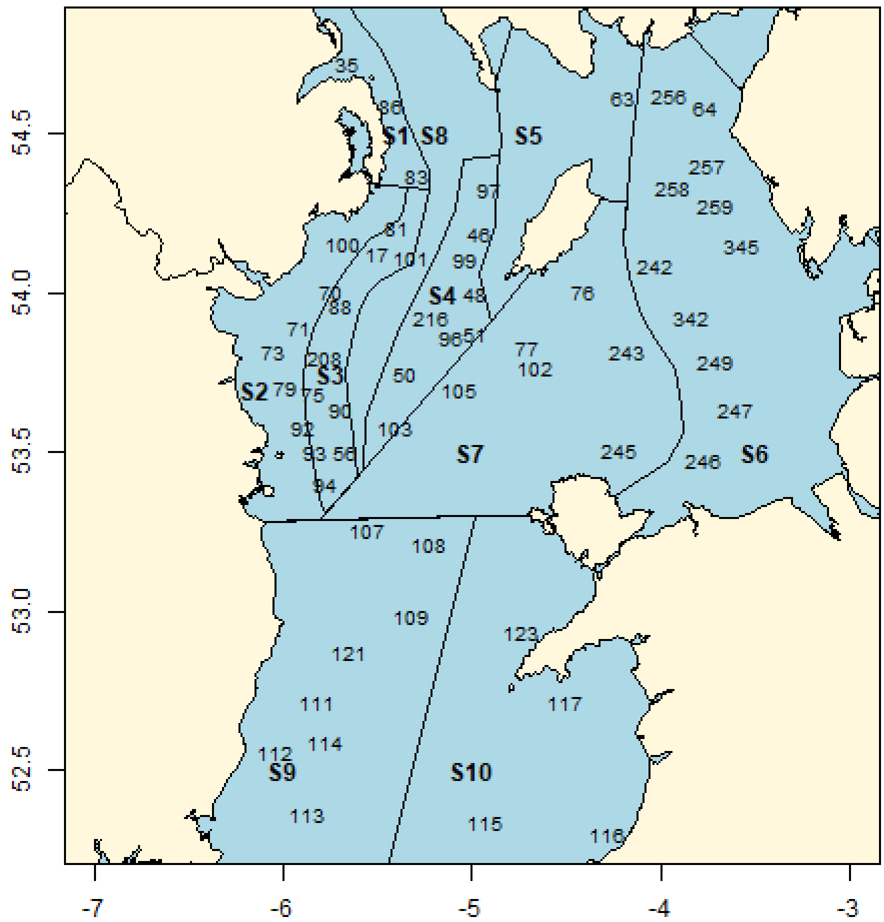


Figure A.5.9.1 - Map of Groundfish Stations completed during CO4120.

A.5.10 - Ireland: Irish Groundfish Survey Q4 – IGFSS2020

NATION:	IRELAND	VESSEL:	CELTIC EXPLORER
Survey:	IE-IGFS	Dates:	25th October – 10th December 2020

Cruise	The Q4 Irish Groundfish Survey (IGFS) collects data on the distribution, relative abundance and biological parameters of commercial commercially exploited demersal species in VIa south, VIIb & VIIg,j north. The indices currently utilised by assessment WG's are for haddock, whiting, plaice, cod, hake and sole. Survey data is also provided for white & black anglerfish, megrim, pollack, ling, blue whiting and a number of elasmobranchs as well as several pelagics (herring, horse mackerel and mackerel).
Gear details:	Two gear survey since 2004, using GOV ground gear "A" for areas VIIb,g & j; and a hopper gear "D"for area VIa.
Notes from survey (e.g. problems, additional work etc.):	9.5 days lost to bad weather during 2020, largely on Leg 1 when delayed 6 days before starting. Some slow operations at other times for same reason. Overall the weather started very poorly with significant blows every 4-5 days curtailing the distance offshore that could be sampled. However, it improved somewhat for later legs. Four additional tows were done on the first day to test the new IBTS survey trawl design before meeting up with Thalassa later in the survey for limited parallel fishing.
Number of fish species recorded and notes on any rare species or unusual catches:	In 2020, 75 species of fish, 20 elasmobranch, 9 cephalopod and 56 crabs and shrimp (Malacostraca) and 118 other species/taxa were caught. The most significant increase in VIa was an increase in blue whiting (*Micromesistius poutassou*) in terms of both biomass (35%) and numbers (117%) on 2019 over the 5 year average (see table xx below). Likewise hake saw similar increases. Most species however still appear on a downward trend over the recent 5 years. Celtic Sea and West of Ireland (VIIb,g,j) again herring showed a good increase in numbers over the 5 year average while numbers dropped slightly. Some increases also for haddock, mackerel and again blue whiting. Values for plaice however were down in all areas for biomass and abundance. These indices are coarse, but the overall perception during the survey in 2020 was for an avergae fishing year by recent standards. Patches of reasonable fishing, but nothing to stand out for any area or species.

Table A.5.10.1 - Stations fished (aim to complete 170 valid tows per year)

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	VALID	ADDITIONAL	INVALID	% STATIONS FISHED	COMMENTS
VIa	All	D	45	31	0	1	71	
VIIb,c	All	A	38	27	4	1	73	
VIIg	All	A	48	41	0	1	87	

VIIj	All	A	40	28	4	0	70
	TOTAL		171	127	8	2	74

**Additional tows in VIIb,j were non-standard IBTS tows done as part of limited gear trials (VIIb)and also parallel trawling in Celtic Sea with Thalassa (VIIj) with new replacement trawl gear.*

Table A.5.10.2 - Biological samples (length, weight, sex, maturity and age material); maturity* (length, weight, sex and maturity); length weight only (length and weight).**

Number of biological samples (maturity and age material, *maturity only):			
Species	No.	Species	No.
Clupea harengus	105	*Microstomus kitt*	902
*Conger conger***	76	*Molva molva*	30
Dicentrarchus labrax	15	*Pleuronectes platessa*	1116
*Dipturus flossada**	30	*Pollachius pollachius***	19
*Dipturus intermedia***	19	*Pollachius virens*	11
Gadus morhua	90	*Psetta maxima***	23
Glyptocephalus cynoglos-	332	*Raja brachyura**	22
Lepidorhombus whiffiagonis	1672	*Raja clavata**	122
*Leucoraja naevus**	78	*Raja montagui**	490
Lophius budegassa	215	*Scomber scombrus*	379
Lophius piscatorius	303	*Scophthalmus rhombus***	18
Melanogrammus aeglefinus	1818	*Solea solea*	218
Merlangius merlangus	1543	*Squalus acanthias**	804
Merluccius merluccius	799	*Trachurus trachurus*	842
Micromesistius poutassou	632	*Zeus faber***	256

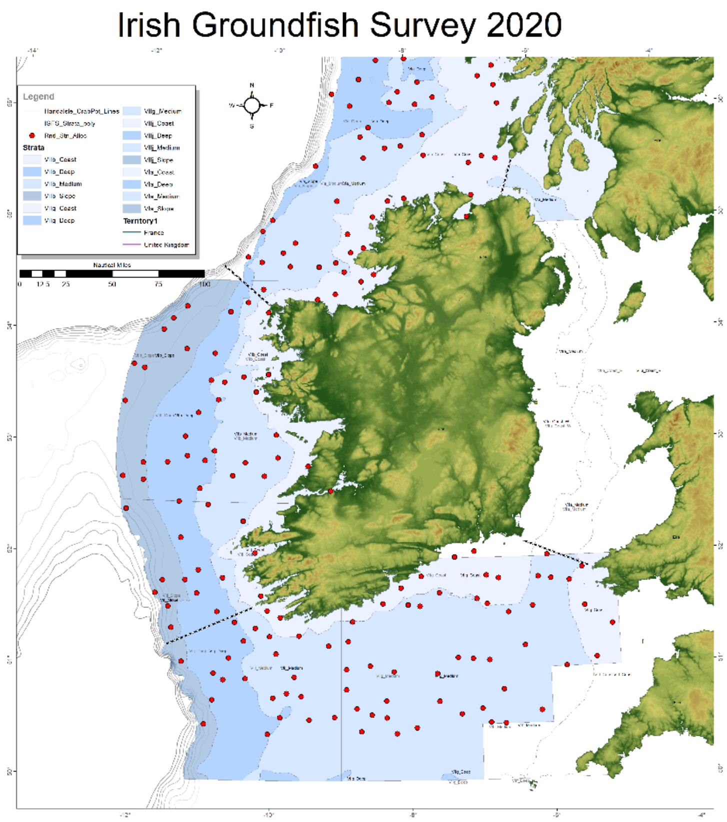


Figure A.5.10.1 - Map of Survey Stations completed by the Irish Groundfish Survey in 2020. Valid = red circles.

Table A.5.10.3 - Abundance in biomass and number of main species during 2020 IGFS compared with previous years.

Biomass and number estimates								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i	y_i/y_{i-1}	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$	y_i	y_i/y_{i-1}	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$
			kg/Hr	%	%	No/Hr	%	%
Gadus morhua	VIa	31	2.0	17.0	-50.7	1.7	-12.6	-30.8
Melanogrammus aeglefinus	VIa	31	353.9	47.7	-12.4	1312.3	39.4	-12.5
Clupea harengus	VIa	31	2.7	-93.4	-70.2	27.3	-97.9	1.4
Merluccius merluccius	VIa	31	13.4	139.5	25.6	61.1	38.2	71.4
Trachurus trachurus	VIa	31	304.9	60.1	-42.4	2112.7	29.0	-46.1
Scomber scombrus	VIa	31	26.9	-80.9	-42.2	553.0	-70.3	-54.7
Lepidorhombus whiffiagonis	VIa	31	1.3	-19.0	-16.9	12.7	31.9	29.9
Lophius piscatorius	VIa	31	2.9	76.9	-32.3	2.8	79.9	-16.1
Pleuronectes platessa	VIa	31	7.4	31.1	-59.5	46.2	41.8	-59.0
Solea solea	VIa	31	0.6	113.3	2.2	2.7	149.2	20.4
Micromesistius poutassou	VIa	31	63.5	-29.9	35.3	2568.1	31.6	117.2
Merlangius merlangus	VIa	31	240.3	73.2	-0.4	1452.3	-13.2	12.7

Gadus morhua	VIIbgj	96	2.3	-17.3	-49.1	1.4	-39.7	30.6
Melanogrammus aeglefinus	VIIbgj	96	193.8	-24.0	120.3	944.7	-48.2	58.8
Clupea harengus	VIIbgj	96	37.7	537.5	282.8	449.5	222.0	-18.8
Merluccius merluccius	VIIbgj	96	18.5	-9.5	-31.0	62.4	-54.7	-58.3
Trachurus trachurus	VIIbgj	96	114.6	-41.5	-5.7	2218.1	-0.5	-35.8
Scomber scombrus	VIIbgj	96	40.0	-55.2	22.1	795.3	-59.1	30.5
Lepidorhombus whiffiagonis	VIIbgj	96	4.2	-15.3	10.0	38.4	-18.2	15.0
Lophius piscatorius	VIIbgj	96	5.7	-35.6	-11.7	6.3	-48.6	5.4
Pleuronectes platessa	VIIbgj	96	5.5	8.7	-44.0	28.7	17.1	-52.0
Solea solea	VIIbgj	96	0.8	5.1	7.6	3.7	-6.9	25.8
Micromesistius poutassou	VIIbgj	96	42.3	-39.1	35.7	1297.8	4.3	91.0
Merlangius merlangus	VIIbgj	96	46.6	-24.7	0.3	643.7	6.7	-6.5

Year estimate 2020 (y_i); previous year estimate 2019 (y_{i-1}); average of last two years estimate ($y_{(i,i-1)}$); average of the previous three year estimates 2016-18 ($y_{(i-2,i-3,i-4)}$). As results for survey trends are ratios they are quite sensitive to stocks with high variance, therefore comparing the 2 yr vs. 5 yr trend is advisable.

A.5.11 - France – East English Channel Survey Q4 – FRCGFS 2020

Nation:	France	Vessel:	THALASSA II
Survey:	CGFS2020	Dates:	22/09/2020 to 19/10/2020

Cruise	As from 2018 France sampled both the Eastern (7d) and Western (7e) English Channel. Currently, only data from the Eastern French English Channel Q4 survey is submitted to DATRAS. Trawling was carried out during the day. CTD was deployed at each trawl station to collect temperature and salinity profiles. Age data were collected for 12 species.
Gear details:	The gear used in the Eastern English Channel is the standard GOV 36/47 with ground gear A, with Marport sensors to record doors, wings and vertical opening parameters.
Notes from survey (e.g. problems, additional work etc.):	Due to the COVID-19 pandemic and the lockdown in France, our JNC Cruise application form was unfortunately not processed in a timely manner in the French foreign Ministery in Paris. Despite our efforts to try to solve this issue we did not receive the formal authorisation to work in UK waters before the starting of the cruise. Therefore only the French waters of the English Channel were sampled. The Thalassa left Cherbourg (France) on October 4th. The Eastern Channel was covered with 59 GOV hauls stations including 58 validated. Among the 58 validated trawls, only 52 belong to the original DATRAS series and sampling stations of the CGFS survey. Having extra time at sea and after prospecting the region we sampled at 6 additional stations (see map for locations) that are referenced and can be used for other surveys. Data from the additional 6 stations have been including in the submittion to DATRAS. *Additional works* : - The CUFES device (Continuous Underwater Fish Egg Sampler) was used during all the survey (day and night) and samples were scanned on board. - Plancton samples were collected for analysis on the planktonic foodweb structure (110 stations with a plankton net (20µm), WP2 and Fluoroprobe) - Microplastic was collected with a Manta net - Observers for mammals and birds information was collected throut out the survey.
Number of fish species recorded and notes on any rare species	60 different fish species were recorded (sharks and rays included). Cephalopods and shellfish were also measured and benthic fauna identified within each haul.

or unusual catches:	

Table A.5.11.1 - Stations fished

ICES Divisions	Strata	Gear	Stations Planned	Valid Stations Achieved	Additional Stations	Invalid Stations	% Stations Achieved	Comments
7d	All	GOV-A	74	52	6	1	70	No access to UK area because of delay in application

Table A.5.11.2 - Number of biological samples (weight, maturity and age material (otoliths)

Species	Age	Species	Age
Merlangus merlangius	**278** 257 (7D) – 21 (7E)	*Gadus morhua*	**6** 4 (7D) – 2 (7E)
Mullus surmuletus	**151** 144 (7D) – 7 (7E)	*Dicentrarchus labrax*	**254** 211 (7D) – 43 (7E)
Pleuronnectes platessa	**336** (7D)	*Chelidonichthys cuculus*	**213** 100 (7D) – 113 (7E)
Trisopterus luscus	**161** 100 (7D) – 61 (7E)	*Solea Solea*	**300** (7D)
Melanogrammus aeglefinus	**4** (7E)	*Scophthalmus maximus*	**18** (7D)
Pollachius pollachius	**10** (7E)	*Scophthalmus rhombus*	**3** (7D)

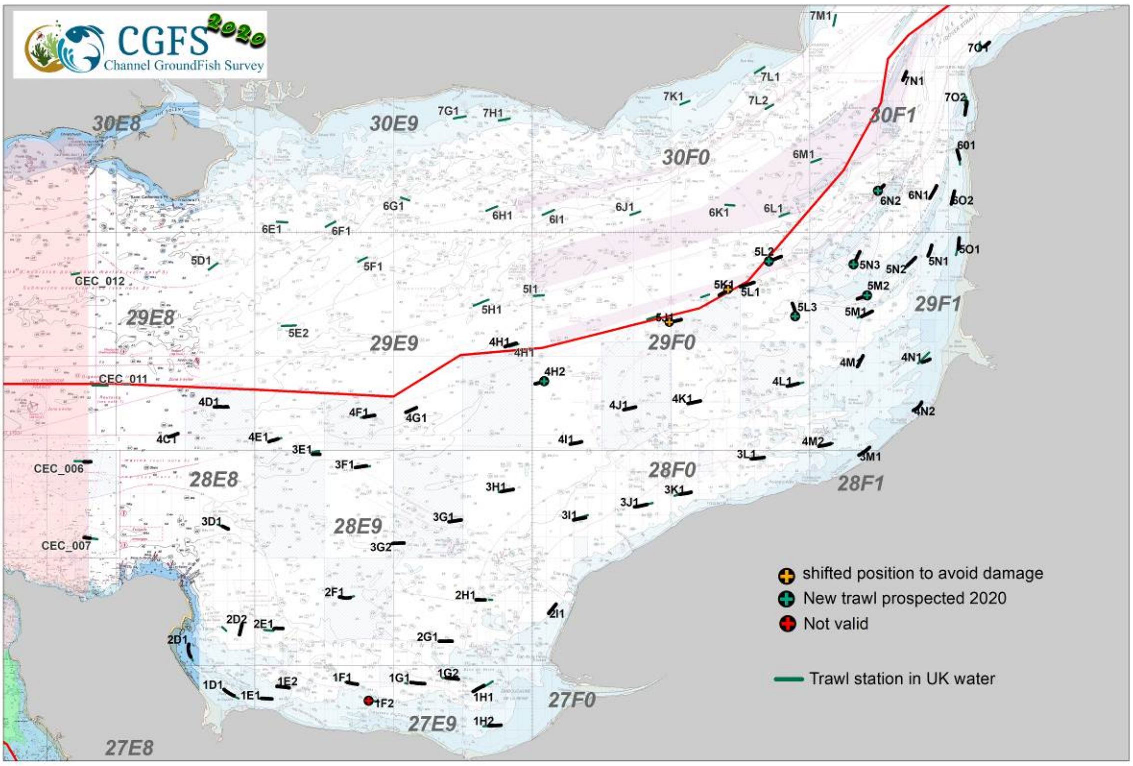


Figure A.5.11.1 - GOV hauls FRCGFS-Q4 2020

A.5.12 - France – EVHOE Q4 2020

Nation:	**France**	**Vessel:**	**Thalassa 2**
Survey:	EVHOE 2020	Dates:	25 October – 6 December 2020

Cruise	Realized on the R/V Thalassa each year in autumn, EVHOE Groundfish survey aims at collecting data on the distribution, relative abundance and biological parameters of all fish and selected commercial invertebrates in subareas 7f-j and 8a,b,d. The primary species are hake, monkfishes, megrim, cod, haddock and whiting. Data are also collected for all other demersal, pelagic fish and cephalopods as well as for the whole invertebrate megafauna. From 2016 onward, sampling design is fixed, based on a previously randomly selected set of points based on bathymetric and sedimentary strata.
Gear details:	A GOV (36/47) with standard Ground gear (A) but no kite replaced by 6 extra floats. The boards have been replaced by new equivalent ones and the ground gear attachment has been adjusted to be more in line with the original plan of the trawl and to limit the risk of damage. Marport sensors have been utilized to record doors, wings, and vertical net opening.
Notes from survey (e.g. problems, additional work etc.):	Contrary to previous years, the survey was carried out in 2 legs of 3 weeks (instead of the usual 3 legs of 15 days). However, the sampling plan was not modified. Four stations had to be moved in the Celtic Sea to respect the rules of access to the marine protected areas of the United Kingdom. These stations were relocated as close as possible to the points initially planned and in the same strata. 100.6 % of the initial program have been realized and validated (156 valid hauls of 155 initially planned, see table A.5.12.1 and figure A.5.12.1). As in the previous year we continued the strategy based on live acoustics in order to detect strong aggregations of pelagic fish and avoid the risk of damage and sorting difficulties. When strong acoustic detections have been observed we reduced the length of the tow trying to keep the time accepted as valid (≥20 minutes) or sometimes by stopping the trawling in progress. 15 hauls were made this way with a duration from 20 to 29 minutes. One trawl tow cancelled due to the exceptional catch of a basking shark (around 7m long). In order to try to compensate for the loss of the Pelgas pelagic survey in the spring of 2020 due to the COVID-19 epidemic, we amplified this year the observation of small pelagics. This resulted in an increase in the acoustic monitoring with the multibeam echosounder, additional measurements and biological samples, in particular on anchovy. In addition, we benefited from the monitoring of professional vessels (following "Pelgas" protocol), which allowed us to ensure the control of acoustic detections by the targeted capture of schools of pelagic fish. These additional operations did not affect the normal course of the EVHOE survey. Finally, a few tows were carried out on stations (planned in the standard protocol) identical to those of the Celtic Explorer in the Celtic Sea in order to compare the catches of the "classic" GOV operated by the Thalassa and the new version currently being tested on board the Celtic Explorer.

	During the survey following additional data collection have been performed : - A total number of 5640 biological samples (otoliths, scales and/or illicia) have been realised (table A.5.12.2). For the second consecutive year, the addition of samples for mackerel mainly explains the increase in the number of samples compared to previous years -Trawl geometry data (Marport sensors) have been collected during all the hauls. -156 CTD temperature and salinity profile - during transects and trawling hauls continuous records with multibeam echosounder to collect data for pelagic ecosystem - Wastes were counted and weighted at each trawl station. - Invertebrates ("benthos", 209 taxa) were sorted, identified counted and weighted at the lowest taxonomic level (mostly species) for each trawled station. - mammals and birds observations during the legs 1 and 2. Additional works, partly for MSFD, were realized at night mostly in the evening or early morning: • 30 Manta net hauls for collecting surface microplastics was put up during first and second leg • 16 samples with WP2 net for zoo and phytoplankton were collected during parts one and two. • transects with CUFES device (Continuous Underwater Fish Egg Sampler) • 38 vertical profiles with "SBE 19 Bathysonde" to collect temperature, phytoplankton, particle densities ... • 16 Additional vertical profiles with "SBE 19 Bathysonde" were done to collect water samples for eDNA analysis test • 44 Photo/Video transects with PAGURE sledge and 3 with SCAMPI for deeper areas • 29 "profiles boxes" with multibeam echosounder to collect bathymetry and reflectivity data • acoustic transects (ME70 echo-sounder) for water column - Additional samples and observations have been collected on a set of selected species : muscle, stomach contents, fishes morphometry, sharks and rays tagging
Number of fish species recorded and notes on any rare	About 136 fish and 14 cephalopods taxa were recorded. Only 13 fishes or cephalopods species represented 86% of the total biomass caught (Figure A.5.12.2) and, similarly to previous years, with a high dominance of small demersal-pelagic species (*Capros aper*, *Trachurus trachurus*, *Engraulis encrasicolus*). The biomass of demersal fish was dominated by 4 species: hake (*Merluccius merluccius*), haddock (*Melanogrammus aeglefinus*) especially in the celtic Sea (Figure

species or unusual catches:	A.5.12.3 and A.5.12.4), the small-spotted catshark (*Scyliorhinus canicula*) and the poor cod *Trisopterus minutus*. As in the previous year, 2020 continues with exceptional catches of lobster (*Palinurus elephas*). As in 2019, stronger catches of certain rays must also be reported such as *Raja clavata* and *R. undaluta* (both with a significantly higher occurrence also), *Leucoraja fullonica* and *L. naevus*, *Dasyatis spp.* or for the shark Squalus acanthias. For 3 consecutive years (especially the last 2), the abundance of *Lophius budegassa* is particularly strong (this is not the case for the other anglerfish species *L.piscatorius*), we can note a similar dynamic for the megrim *Lepidorhombus spp*. The total catches of Ilex were still strong this year but less than in 2019 ; this level of catch following a regular increase during the last 7 years. For some others species, the increase in total abundance and biomass observed in previous years continued in 2020, this is the case for example for *Chimaera monstrosa* (mostly small sized individuals).

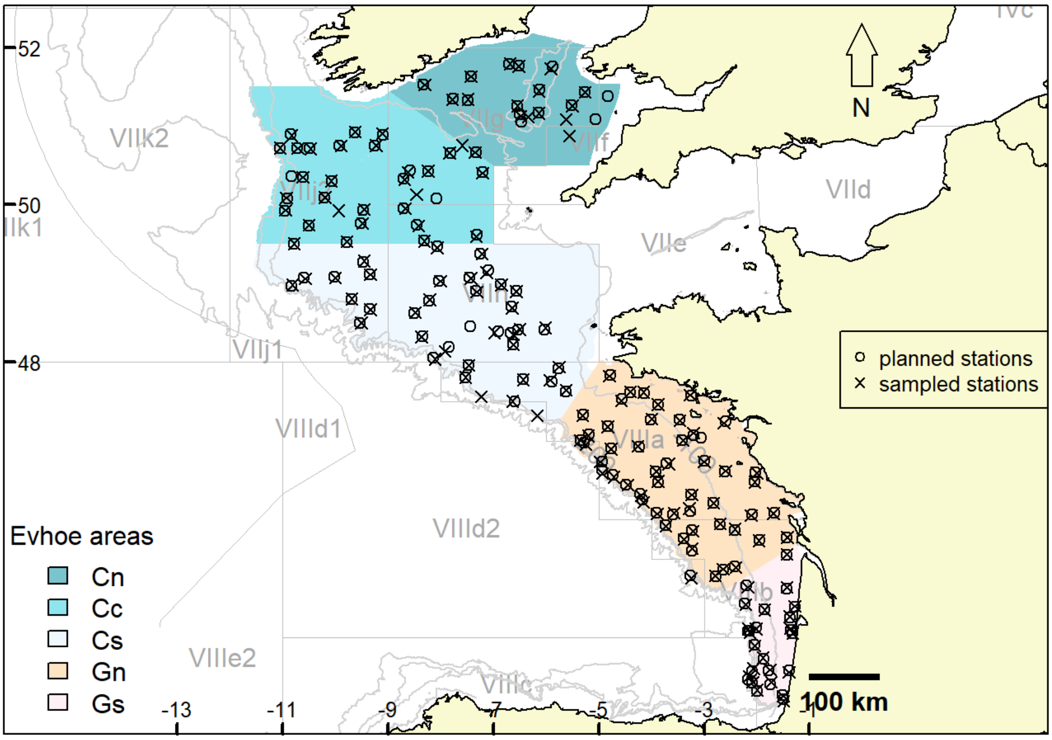


Figure A.5.12.1 - Planned stations in the fixed sampling plan (o) and validated tows (x) for EVHOE 2020. ICES areas as well as EVHOE strata (Gs, Gn, Cs, Cc, Cn) are indicated.

Table A.5.12.1 - Trawling stations planned, realised and validated for the whole EVHOE 2019 survey.

Strata	ICES divisions	GEAR (Sweep length)	TOWS				% Stations sampled (valid)
			planned	realised	valid	Additional	

Cc	7g,h,j	GOV	30	31	31	1	103
Cc3	7g,h,j	GOV (100m)	8	9	9	1	112
Cc4	7g,h,j	GOV (100m)	15	16	16	1	107
Cc5	7g,h,j	GOV (100m)	4	4	4	0	100
Cc6	7g,h,j	GOV (100m)	3	2	2	0	67
Cn	7g,h,j	GOV (m)	16	16	16	0	100
Cn2	7g,h,j	GOV (50m)	7	6	6	0	86
Cn3	7g,h,j	GOV (50m)	9	10	10	1	111
Cs	7g,h,j	GOV (m)	35	35	35	0	100
Cs4	7g,h,j	GOV (100m)	24	23	23	0	96
Cs5	7g,h,j	GOV (100m)	7	6	6	0	86
Cs6	7g,h,j	GOV (100m)	4	6	6	2	150
Gn	8a,b	GOV (m)	51	50	50	0	98
Gn1	8a,b	GOV (50m)	5	5	5	0	100
Gn2	8a,b	GOV (50m)	5	4	4	0	80
Gn3	8a,b	GOV (50m)	14	14	14	0	100
Gn4	8a,b	GOV (100m)	20	20	20	0	100
Gn5	8a,b	GOV (100m)	3	3	3	0	100
Gn6	8a,b	GOV (100m)	2	2	2	0	100
Gn7	8a,b	GOV (100m)	2	2	2	0	100
Gs	8a,b	GOV (m)	23	23	23	0	100
Gs1	8a,b	GOV (50m)	3	3	3	0	100
Gs2	8a,b	GOV (50m)	6	6	6	0	100
Gs3	8a,b	GOV (50m)	4	4	4	0	100
Gs4	8a,b	GOV (100m)	4	4	4	0	100
Gs5	8a,b	GOV (100m)	2	2	2	0	100
Gs6	8a,b	GOV (100m)	2	2	2	0	100
Gs7	8a,b	GOV (100m)	2	2	2	0	100
All		GOV	155	156	156	6	100.6

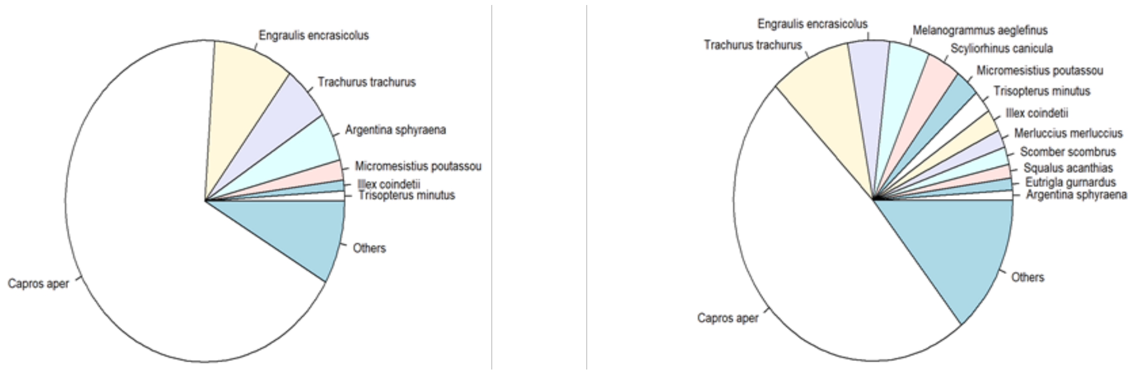
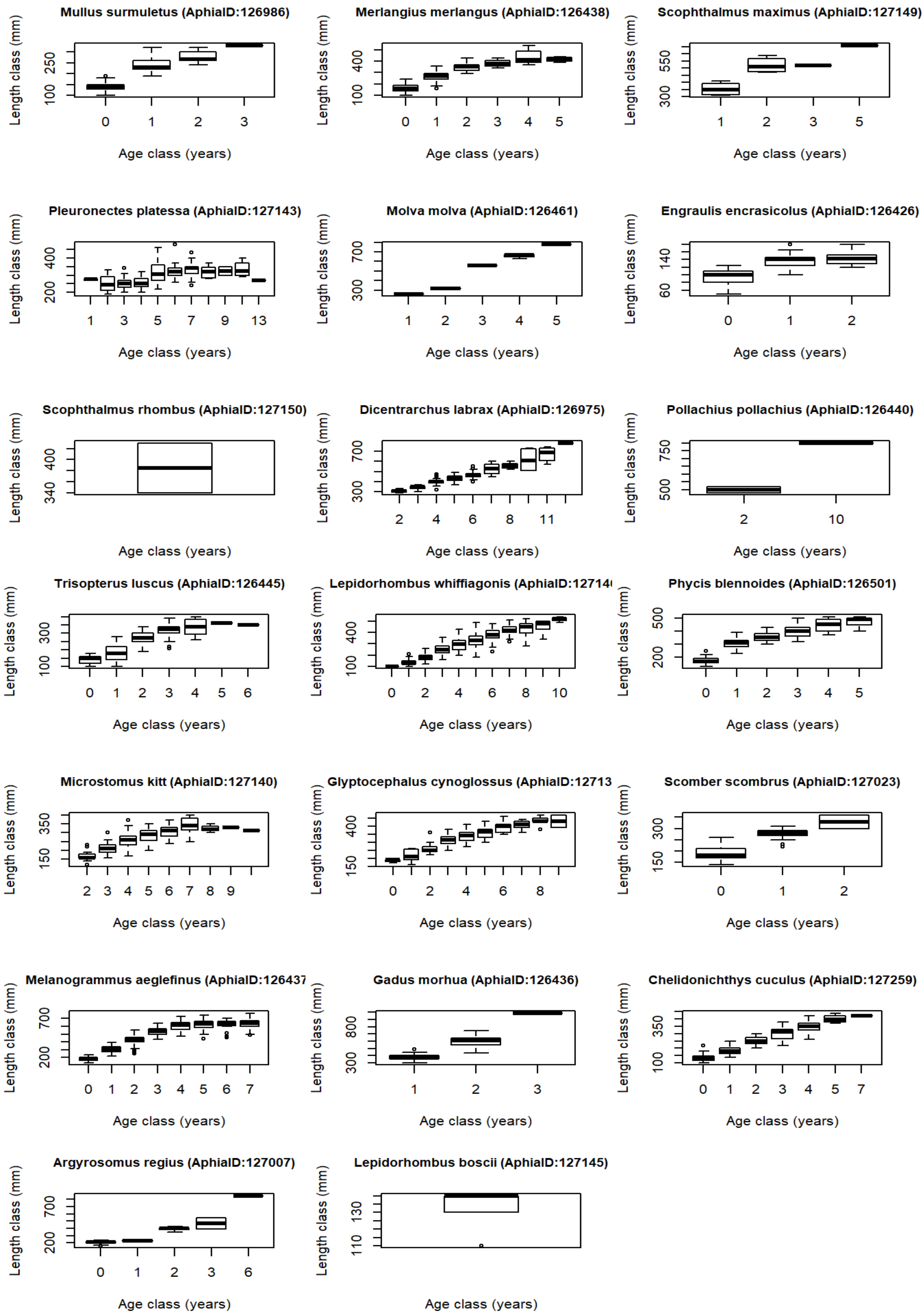


Figure A.5.12.2 - Species dominance over the entire "EVHOE" sampled area in term of A) abundance and B) biomass.

Table A.5.12.2 - Biological observations for species sampled (sex, maturity and collected material for aging) in the ICES Division 8ab and 7fghj

Species	Female (%)	Male (%)	Not sexed (%)	Undeter-mined (%)	Total number of samples	Type of material
Argyrosomus regius	8.5	28	0	63.4	82	Otolith
Chelidonichthys cuculus	60.4	19.8		19.8	187	Otolith
Dicentrarchus labrax	54.5	45.5	0	0	143	Scales
Gadus morhua	57.7	42.3	0	0	52	Otolith
Glyptocephalus cynoglossus	70.3	29.1	0	0.7	148	Otolith
Lepidorhombus whiffiagonis	58.5	38.7	0	2.8	434	Otolith
Lophius budegassa	43.5	38	0	18.5	271	Illicia
Lophius piscatorius	39.2	43.1	0	17.7	209	Illicia
Melanogrammus aeglefinus	58.3	34.6	0	7.1	532	Otolith
Merlangius merlangus	51.9	40.9	0	7.2	621	Otolith
Merluccius merluccius	46.6	36.3	0	17.1	1105	Otolith
Microstomus kitt	47	45.5	0	7.5	200	Otolith
Molva molva	50	50	0	0	6	Otolith
Mullus surmuletus	52.5	37.6	0	9.9	101	Otolith
Phycis blennoides	70.9	11.9	0	17.2	227	Otolith
Pleuronectes platessa	69	31		0	158	Otolith
Pollachius pollachius	66.7	33.3	0		3	
Sardina pilchardus	47	51.9		1.1	185	Otolith
Scomber scombrus	36.8	42.1	0	21.1	228	Otolith
Scophthalmus maximus	75	25	0	0	12	Otolith
Scophthalmus rhombus	0	100	0	0	2	Otolith
Solea solea	54.5	43.5		2	299	Otolith
Trisopterus luscus	34.5	50.3	0	15.3	177	Otolith



A.5.12.3 - Length at age relationships for sampled species during EVHOE 2020.

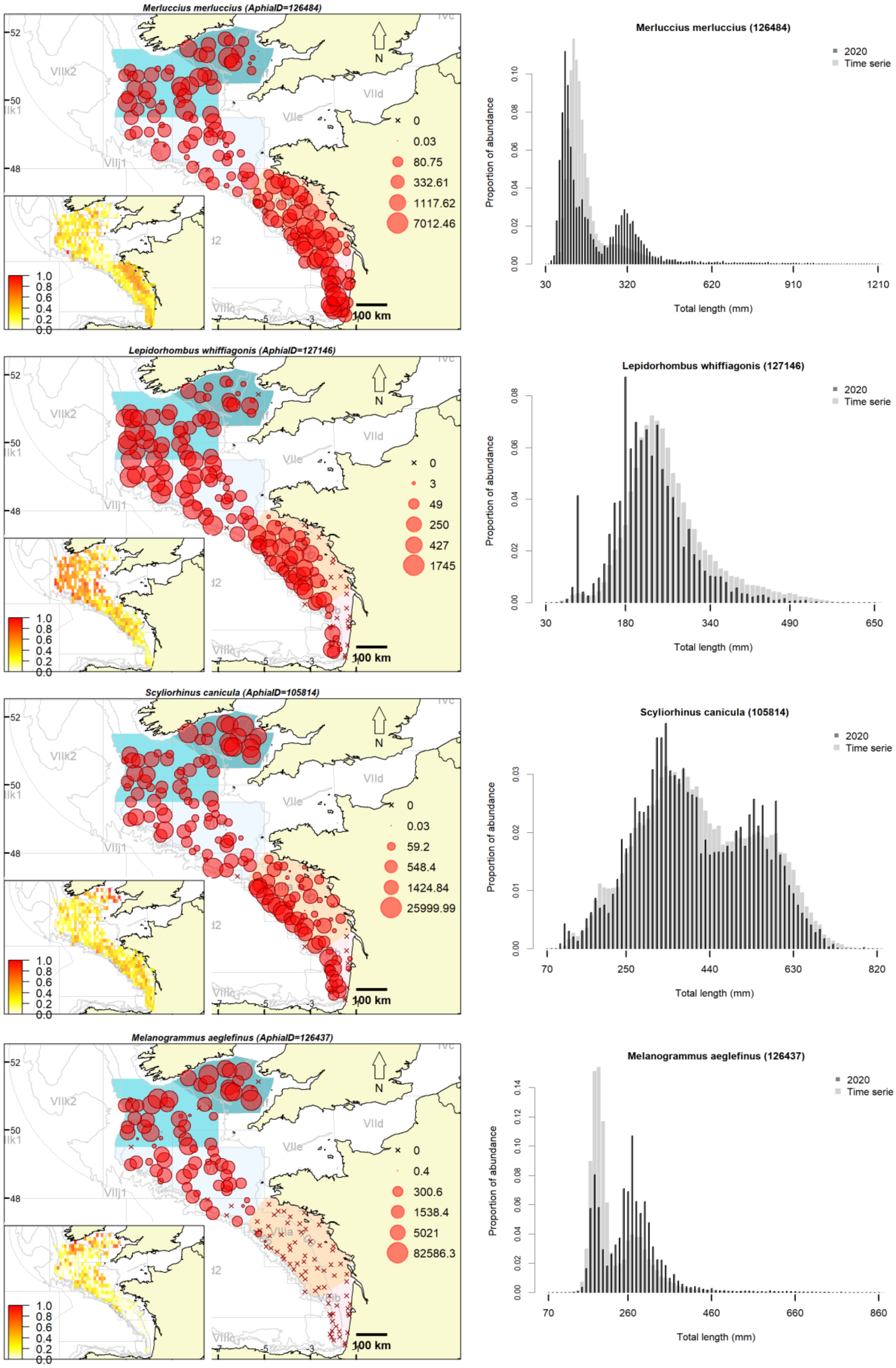


Figure A.5.12.4 - Spatial distribution of biomass and barplot giving size distribution (logarithm of abundance by size class) for the 4 main demersal species (selected from total biomass proportion) caught during IBTS Q4 (EVHOE) survey in 2020 and displaying significant differences as compared to the whole time series (1997 – 2019).

A.5.13 - Spain – NSGFS Q4 2020

NATION:	SP (SPAIN)	VESSEL:	MIGUEL OLIVER
Survey:	SP-NSGFS-Q4 (N20)	Dates:	17 September - 19 October 2020

Cruise	Spanish North Coast bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in ICES Divisions 8c and Northern 9a. The primary species are hake, monkfish and white anglerfish, megrim, four-spot megrim, blue whiting and horse mackerel abundance indices are estimated by age, with abundance indices also estimated for Nephrops, and data collection for other demersal fish and invertebrates.
Survey Design	This survey is random stratified with five geographical strata along the coast and 3 depth strata (70-120 m, 121-200 m, 201-500 m). Stations are allocated at random within the trawlable stations available according to the strata surface.
Gear details:	Standard baca 36/40 with Thyborøn doors
Notes from survey (e.g. problems, additional work etc.):	In spite of the Covid-19 Northern Spanish shelf 2020 survey was carried out with minor problems, although the scientific crew was reduced, most of the aims of the survey were fulfilled, and hauls coverage were normal. The survey was performed on the R/V *Miguel Oliver* as usual since 2013. Results from the survey are in line with those from the time series, showing the usual proportion of bentho-demersal species as megrims, skates, catfish… As in previous years, 2 additional hauls were undertaken to cover shallow stations between 30 and 70 m, and 12 deeper stations, between 500 and 700 m. Additional work undertaken included CTD casts at all trawl stations and dredges carried out with a box-corer and a meso-box-corer to create a grid of sediments and in some areas infauna samples. Seabirds census were not carried out because of the crew restrictions due to COVID-19 restrictions. Analyses of stomach contents of main demersal species was performed in all hauls during the survey.
Number of fish species recorded and notes on any rare species or unusual catches:	A total of 240 species were captured, 93 fish taxa with 91 species, 47 crustaceans taxa with 45 species , 45 molluscs taxa with 41 species, 38 echinoderms taxa with 33 species and 51 other invertebrates taxa with 34 species.

Table A.5.13.1 - Stations fished (aim: to complete 116 valid tows per year)

ICES Divisions	Strata	Gear	Tows planned	Valid	Additional	Invalid	% stations fished	Comments
8c	All	Standard baca	96	89	11 (1)	0	98%	
9a North	All	Standard baca	20	19	3	0	99%	
8b	All	Standard baca	0	0	1	0	Na	
	TOTAL		116	108	15	0	112%	

(1) Additional 15 hauls on shallow and deep grounds.

Table A.5.13.2 - Biological samples (length, weight, sex, maturity and age material)

Species	Age	Species	Age
Merluccius merluccius	600	*Scomber scombrus*	429
Lepidorhombus whiffiagonis	478	*Mullus surmuletus*	70
Lepidorhombus boscii	610	*Scomber colias*	52
Lophius budegassa	35	*Zeus faber***	54
Lophius piscatorius	46	*Trisopterus luscus*	256
Trachurus trachurus	435	*Helicolenus dactylopterus*	154
Micromesistius poutassou	825	*Phycis blennoides*	276
Engraulis encrasicolus	255	*Conger conger***	195
*Nephrops norvegicus**	79		

(*) Maturity only.

(**) Otoliths and vertebrae, only the former read for John Dory.

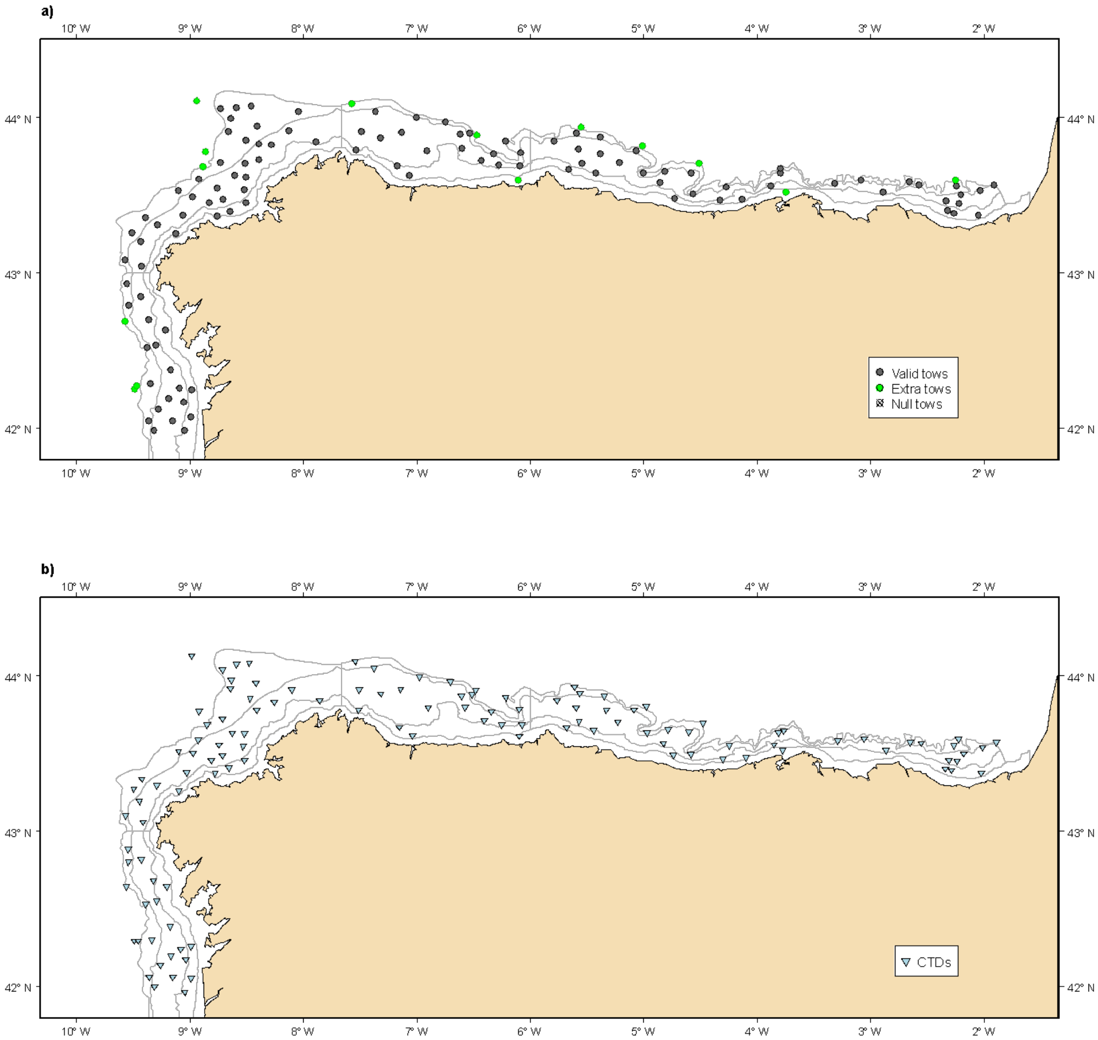


Figure A.5.13.1 - a) Trawl stations in northern Spanish Shelf 2020 survey, b) CTD and dredge stations.

Table A.5.13.3 - Biomass and abundance estimates for N20

Table A.5.13.3 - Biomass and abundance estimates for N20

Biomass and number estimates								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	9aN	19	6.57	56.4	-25.3	200.0	30.0	-19.9
Lepidorhombus boscii	9aN	19	4.1	-14.4	-23.1	65.8	-16.6	-32.1
Lepidorhombus whiffiagonis	9aN	19	0.24	33.3	75.0	2.7	-19.9	157.8

Lophius budegassa	9aN	19	0.05	-78.3	-17.6	0.1	0.0	-77.3
Lophius piscatorius	9aN	19	0.00	--	-100.0	0.0	--	-100.0
Micromesistius poutassou	9aN	19	380.48	2278.0	307.6	8757.0	2537.5	220.8
Trachurus trachurus	9aN	19	23.8	2379.2	-74.7	210.1	3963.1	-79.9
Scomber scombrus	9aN	19	39.22	5842.4	339.2	490.2	19122.0	324.2
Nephrops norvegicus	9aN	19	0.00	-100.0	0.0	0.0	-100.0	12.5
Merluccius merluccius	8c	89	5.21	-14.4	-17.6	116.9	-30.8	-36.3
Lepidorhombus boscii	8c	89	5.86	-2.2	9.7	104.4	-2.4	13.6
Lepidorhombus whiffiagonis	8c	89	4.52	-4.0	16.7	61.0	11.0	7.6
Lophius budegassa	8c	89	0.34	-27.7	-43.0	0.3	60.0	-31.6
Lophius piscatorius	8c	89	0.88	37.5	0.4	0.5	18.4	85.8
Micromesistius poutassou	8c	89	81.27	144.8	-57.9	1930.9	194.7	-64.2
Trachurus trachurus	8c	89	10.72	17.2	-68.3	176.7	0.0	-74.9
Scomber scombrus	8c	89	2.16	-9.2	60.2	21.2	-43.8	-28.3
Nephrops norvegicus	8c	89	0.04	-20.0	35.0	0.6	-33.7	1.4
Merluccius merluccius	Total	108	5.45	-5.4	-19.0	131.2	-21.2	-33.5
Lepidorhombus boscii	Total	108	5.56	-3.8	3.8	97.8	-4.3	4.8
Lepidorhombus whiffiagonis	Total	108	3.79	-3.6	17.1	50.9	10.6	8.3
Lophius budegassa	Total	108	0.29	-32.6	-41.3	0.3	58.8	-37.1
Lophius piscatorius	Total	108	0.73	37.7	-2.6	0.4	15.6	69.7
Micromesistius poutassou	Total	108	132.71	338.9	-32.6	3104.5	417.7	-42.7
Trachurus trachurus	Total	108	12.97	67.4	-69.9	182.5	23.9	-75.6
Scomber scombrus	Total	108	8.53	310.1	172.1	101.9	221.3	51.7
Nephrops norvegicus	Total	108	0.03	-25.0	16.7	0.5	-37.2	1.3

$\mathbf{y_i}$, year estimate (2020); $\mathbf{y_{i-1}}$, previous year estimate (2019); $\mathbf{y_{(i,i-1)}}$, Average of last two year estimates (2020 and 2019); $\mathbf{y_{(i-2,i-3,i-4)}}$, Average of the previous three year estimates (2018, 2017 and 2016).

A.5.14 – Spain – SP GCGFS Q4 2020

NATION:	SP (SPAIN)	VESSEL:	MIGUEL OLIVER
Survey:	SP-GCGFS-Q4 (ARSA 1120)	Dates:	27 October - 11 November 2020
Cruise	Spanish Gulf of Cadiz bottom trawl survey aims to collect data on the distribution and relative abundance, and biological information of commercial fish in the Gulf of Cadiz area (ICES Division 9a). The primary species are hake, horse mackerel, wedge sole, sea breams, mackerel and Spanish mackerel. Data and abundance indices are also collected and estimated for other demersal fish species and invertebrates as rose and red shrimps, Nephrops and cephalopod molluscs.		
Survey Design	The survey is random stratified with 5 depth strata (15-30 m, 31-100 m, 101-200 m, 201-500 m, 501-800 m). Stations are allocated at random according to the strata surface.		
Gear details:	Baca 44/60 with Thyborøn doors (350 Kg).		
Notes from survey (e.g. problems, additional work etc.):	Hydrographic data at each trawl station was collected using a net-mounted CTD. Analyses of stomach contents of main demersal species was performed during the survey.		
Number of fish species recorded and notes on any rare species or unusual catches:	Overall a total of 149 fish species, 56 crustaceans and 55 molluscs were recorded.		

Table A.5.14.1 - Stations fished (aim: to complete 45 valid tows per year)

ICES DIVISIONS	STRATA	GEAR	TOWS PLANNED	VALID	ADDITIONAL	INVALID	% STATIONS FISHED	COMMENTS
9a	All	Baca 44/60	45	44	-	-	98%	
	TOTAL		45	44	-	-	98%	

Table A.5.14.2 - Biological samples (length, weight, sex, maturity and age material)

SPECIES	AGE	SPECIES	AGE
Merluccius merluccius	376	*Octopus vulgaris**	131
*Merluccius merluccius**	1197		
*Parapenaeus longirostris**	2231		
*Nephrops norvegicus***	135		

(*) Maturity only

(**) Tagging

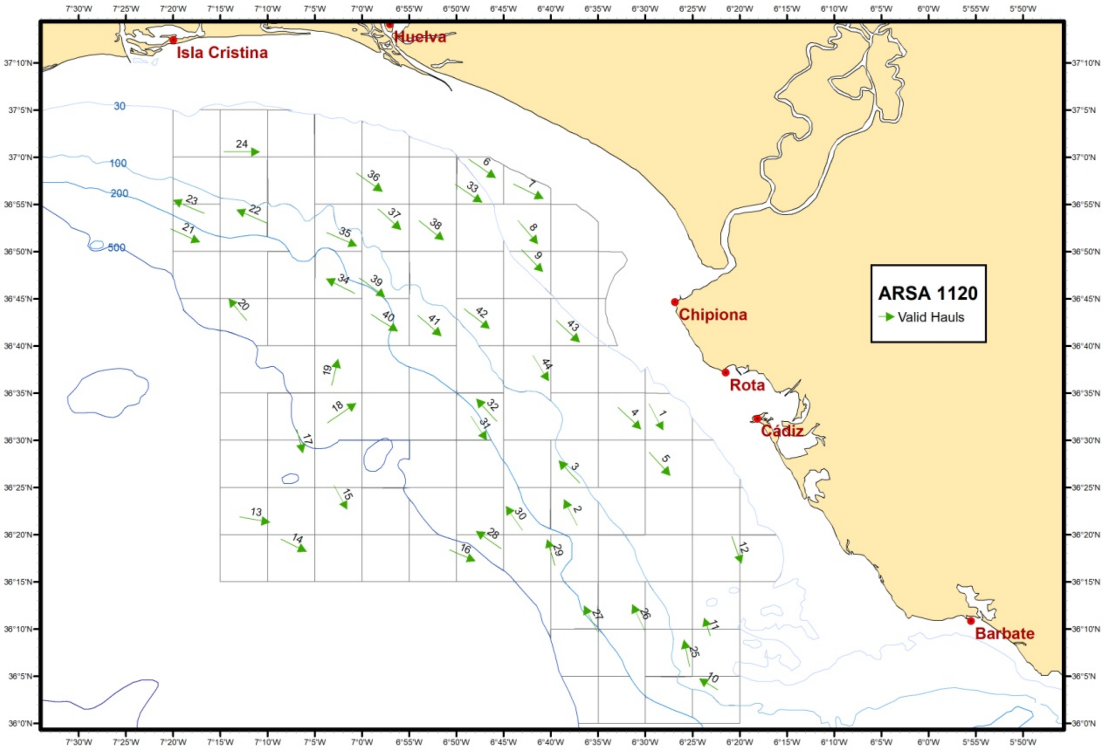


Figure A.5.14.1 - Trawl stations in Q4 Gulf of Cadiz 2020 survey.

Table A.5.14.3 - Biomass and abundance estimates for ARSA 1120

BIOMASS AND NUMBER ESTIMATES								
			Biomass index			Number index		
Species	Strata	Valid tows	y_i kg/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %	y_i n/0.5h	y_i/y_{i-1} %	$y_{(i,i-1)}/y_{(i-2,i-3,i-4)}$ %
Merluccius merluccius	All	44	2.27	-44.2	1.9	26.5	-86.2	83.1
Micromesistius poutassou	All	44	0.64	-78.0	-81.7	4.4	-90.3	-83.8
Nephrops norvegicus	All	44	0.36	-12.3	-6.2	10.2	-35.5	-13.3
Parapenaeus longirostris	All	44	1.08	33.5	14.4	219.0	71.4	-6.9
Octopus vulgaris	All	44	0.71	11.0	-42.8	1.2	-6.5	-50.4
Loligo vulgaris	All	44	0.95	-48.1	45.3	7.2	-73.7	145.4
Sepia officinalis	All	44	0.73	-43.6	30.2	2.0	-49.5	37.4

y_i, year estimate (2020); **y_{i-1}**, previous year estimate (2019); **$y_{(i,i-1)}$**, Average of last two year estimates (2020 and 2019); **$y_{(i-2,i-3,i-4)}$**, Average of the previous three year estimates (2018, 2017 and 2016).

A.5.15 – Portugal: Autumn Groundfish Survey – Autumn 2020

NATION:	PT (PORTUGAL)	VESSEL:	MÁRIO RUIVO
Survey:	PT-GFS- Q4 (Autumn2020)	Dates:	05-22 December 2020
Cruise	The Portuguese Autumn Groundfish Survey (PT-GFS), undertaken every year since 1979, aims to estimate indices of abundance and biomass and distribution of hake and horse mackerel recruits, indices of abundance and biomass of the most important commercial species, biological parameters, e.g. maturity, ages, sex-ratio, weight, food habits and biodiversity indicators. The primary species are hake, horse mackerel, blue whiting, mackerel and Spanish mackerel. Other data is also collected for several other demersal fish species and invertebrates, focusing in providing the necessary information for stock assessment of commercial species. This survey is the most important source regarding information for biodiversity, biological parameters, food habits and distribution for a large number of marine species on the Portuguese shelf and slope.		
Area	Portuguese continental waters (Div. IXa), from 20 to 500 m depth.		
Survey Design	96 fishing stations, 66 at fixed (grid) positions and 30 at random. Tow duration is 30 min, with a trawl speed of 3.5 knots, during day light. Temperature is recorded with a CTD (Conductivity, Temperature, Depth) equipment at the end of each haul. Scanmar used to monitor gear parameters.		
Gear details:	NCT (Norwegian Campbell Trawl) gear with rubber disks in the groundrope. The mean horizontal opening between the wings is 14.7 m and the mean vertical opening is 4.4 m. Codend mesh size is 20 mm.		
Notes from survey (e.g. problems, additional work etc.):	This survey was not carried out in 2019 due to IPMA not being able to overcome the administrative and legal constraints of national scope that turned unfeasible the hiring of fishing and vessel crew on time to undertake 2019 PT-GFS. The survey was planned to be conducted onboard RV "Mário Ruivo" (former RV Mar Portugal) from 1st October to 31st October 2020. Unfortunately, a combination of legal/logistic constraints, Covid19 outbreak onboard and bad weather delayed the start of the survey to dates that were not suitable to perform more than 3 fishing days on the 9th, 18th and 21st December 2020, which were used to perform testing on the modified NCT, where rollers were replaced by an 18m footrope fitted with 30 cm rubber disks. 6 stations were successfully performed and data will be used to fill gaps in biological sampling due to COVID-19 restrictions. Net monitoring was performed using Scanmar sensors.		
Number of fish species recorded and notes on any	Only biological samples collected, no data for indices estimation.		

rare species or unusual catches:	

Figure A.5.15.1 - RV "Mário Ruivo"

Figure A.5.15.2 - NCT footrope: Left with rollers, Right with new rubber disks

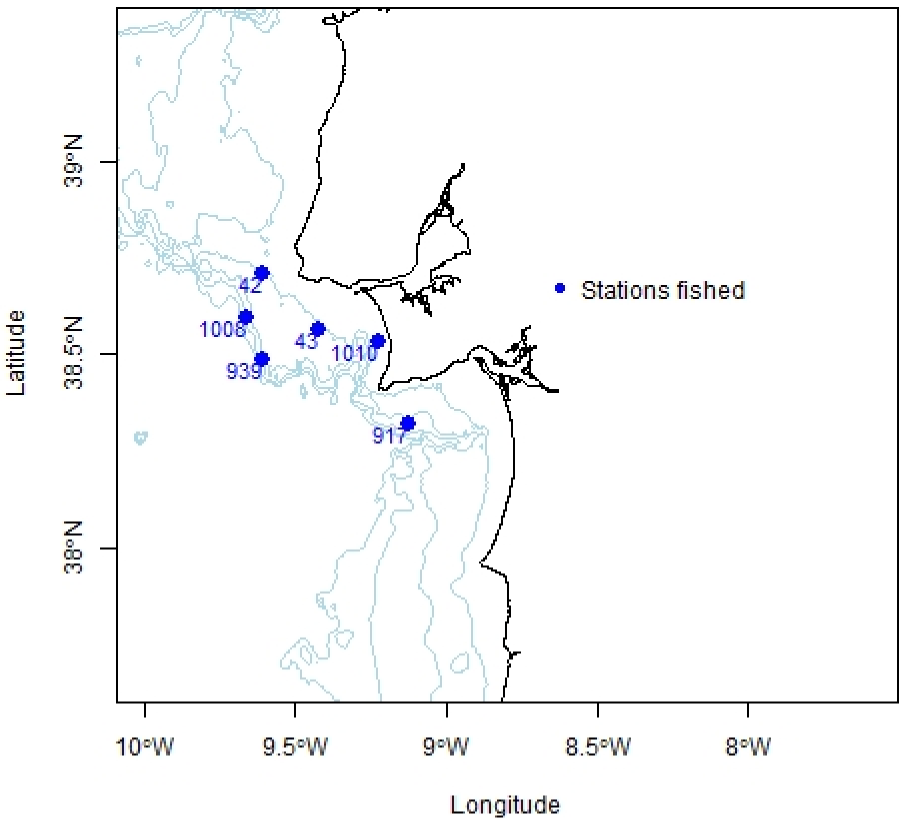


Figure A.5.15.3 - Location of stations for NCT tests

Table A.5.15.1 - Stations fished (aim: to complete 2 valid tows per strata)

ICES Divisions	Strata	Gear	Tows planned	Valid	Additional	Invalid	% stations fished	Comments
9a	All	NCT	96	-	6	-	6%	
	TOTAL		96	-	6	-	6%	

Table A.5.15.2 - Biological samples (length, weight, sex, maturity and age material)

Species	Age	Species	Age
Merluccius merluccius **	125 (70**)	*Micromesistius poutassou*	137
Lepidorhombus boscii	55	*Zeus faber*	7
*Lophius budegassa***	15	*Trachurus trachurus*	92
*Nephrops norvegicus**	6	*Parapenaeus longirostris**	7

(*) Maturity only

(**) Genetic Samples

Annex 6: Species distribution maps in 2020

Table A.6.1. Species for which distribution maps have been produced, with length split for pre-recruit (0-group) and post-recruit (1+ group) where appropriate. The maps cover all the area encompassed by surveys coordinated within the IBTSWG (North Sea and North-eastern Atlantic Areas).

Scientific	Common	Code	Fig No	Length Split (<cm)
Capros aper	Boarfish	BOC	44	
Clupea harengus	Herring	HER	6-7	17.5
Conger conger	Conger	COE	45	
Gadus morhua	Atlantic Cod	COD	2-3	23
Galeorhinus galeus	Tope Shark	GAG	33	
Galeus melastomus	Blackmouthed dogfish	DBM	31	
Lepidorhombus boscii	Four-Spotted Megrim	LBI	16-17	19
Lepidorhombus whiffiagonis	Megrim	MEG	14-15	21
Leucoraja naevus	Cuckoo Ray	CUR	35	
Lophius budegassa	Black-bellied Anglerfish	WAF	20-21	20
Lophius piscatorius	Anglerfish (Monk)	MON	18-19	20
Merlangus merlangius	Whiting	WHG	24-25	20
Melanogrammus aeglefinus	Haddock	HAD	4-5	20
Merluccius merluccius	European hake	HKE	8-9	20
Micromesistius poutassou	Blue whiting	WHB	26-27	19
Mustelus spp.	Smooth Hound	SMH	34	
Nephrops norvegicus	Norway Lobster	NEP	28	
Pleuronectes platessa	European Plaice	PLE	22-23	12
Raja brachyura	Broadnose skate	RJH	40	
Raja clavata	Thornback ray (Roker)	THR	36	
Raja microocellata	Painted/Small Eyed Ray	PTR	37	
Raja montagui	Spotted Ray	SDR	38	
Raja undulata	Undulate Ray	UNR	39	
Scomber scombrus	European Mackerel	MAC	12-13	24
Scyliorhinus canicula	Lesser Spotted Dogfish	LSD	29	
Scyliorhnus stellaris	Nurse Hound	DGN	30	
Sprattus sprattus	European sprat	SPR	41	
Squalus acanthias	Spurdog	DGS	32	
Trachurus picturatus	Blue Jack Mackerel	JAA	43	
Trachurus trachurus	Horse Mackerel (Scad)	HOM	10-11	15
Trisopterus smarkii	Norway pout	NPO	42	
Zeus faber	John Dory	JOD	46	

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

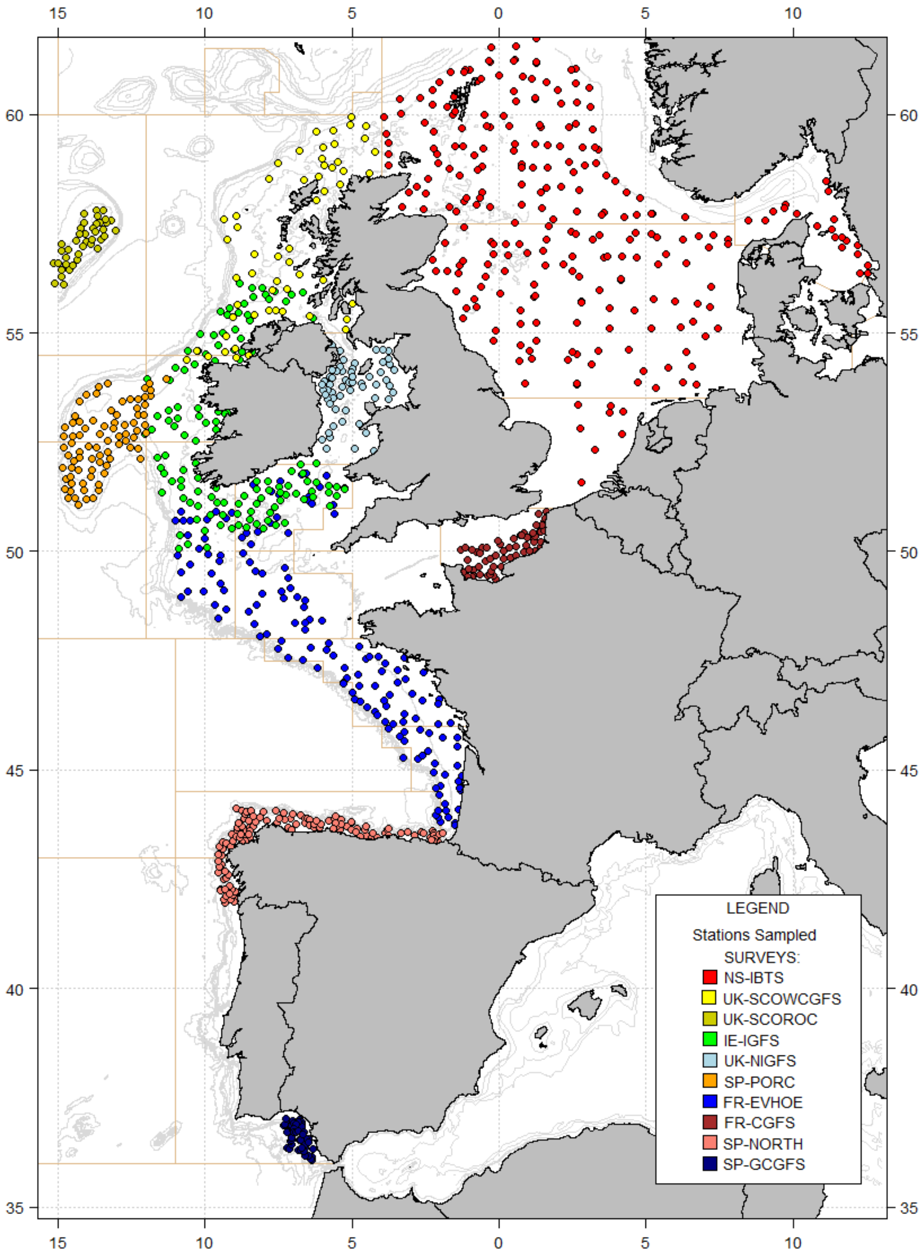


Figure A.6.1. Station positions for the IBTSurveys carried out in the North Eastern Atlantic and North Sea area in summer/autumn of 2020: Quarters 3 and 4.

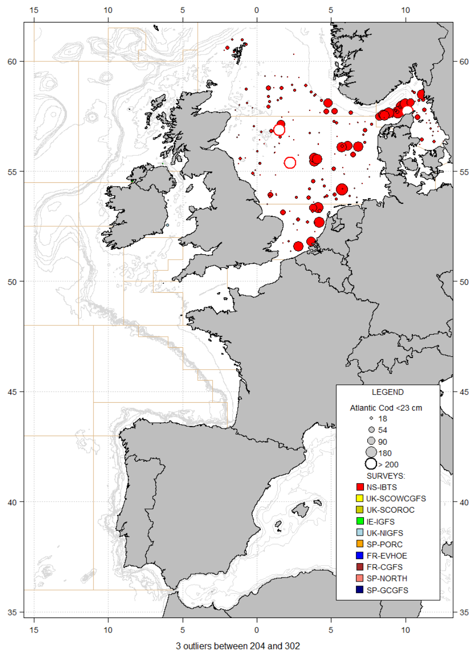


Figure A.6.2. Catches in numbers per hour of 0-group Cod, *Gadus morhua* (<23cm), in summer/autumn 2020 IBTSurveys.

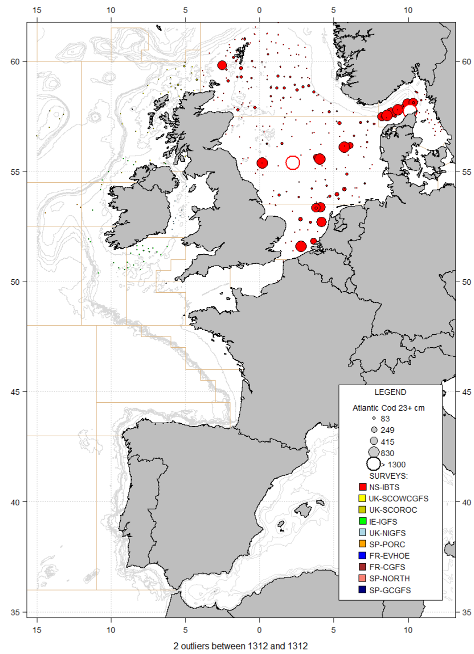


Figure A.6.3. Catches in numbers per hour of 1+ cod, *Gadus morhua* (≥23cm), in summer/autumn 2020 IBTSurveys.

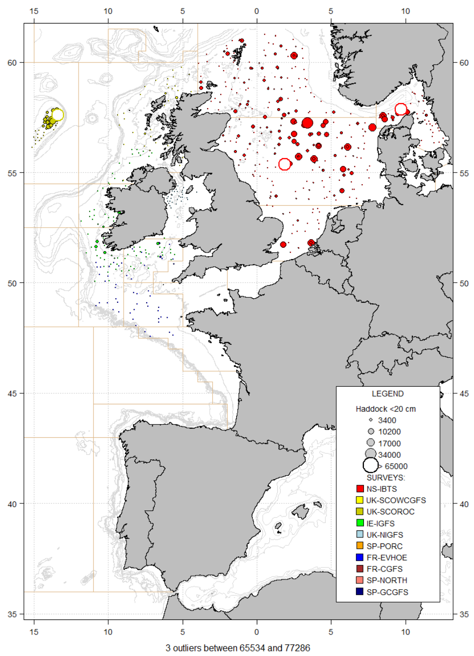


Figure A.6.4. Catches in numbers per hour of 0-group haddock, *Melanogrammus*

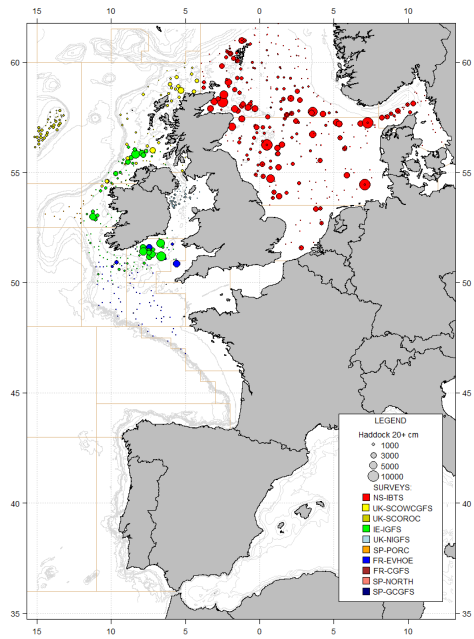


Figure A.6.5. Catches in numbers per hour of 1+ group haddock, *Melanogrammus* *aeglefinus* (<20cm), in summer/autumn 2020 IBTSurveys.

aeglefinus (≥20cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey.

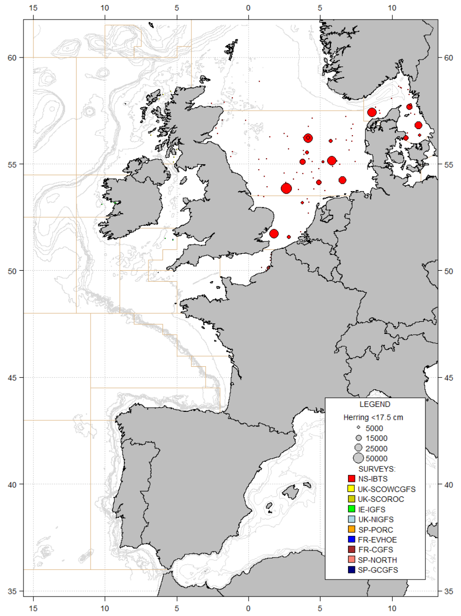


Figure A.6.6. Catches in numbers per hour of 0-group herring, *Clupea harengus* (<17.5 cm), in summer/autumn 2020 IBTSurveys.

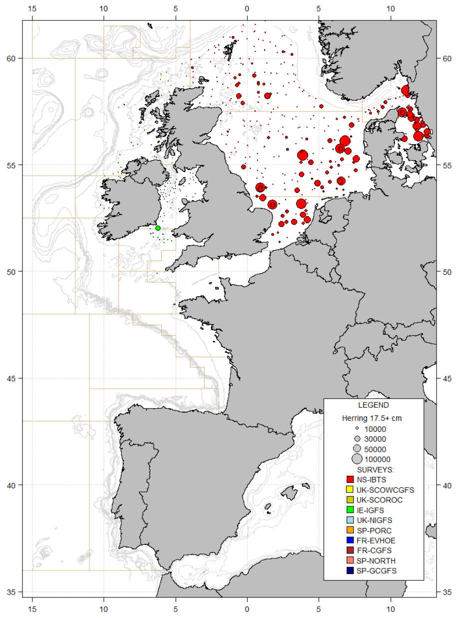


Figure A.6.7. Catches in numbers per hour of 1+ group herring, *Clupea harengus* (≥17.5 cm), in summer/autumn 2020 IBTSurveys.

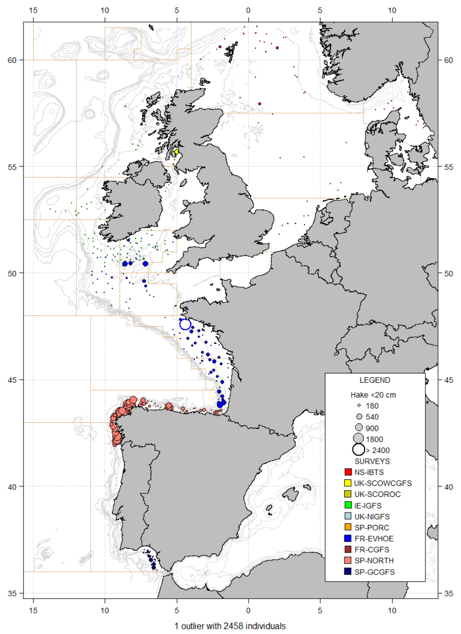


Figure A.6.8. Catches in numbers per hour of 0-group European hake, *Merluccius merluccius* (<20cm), in summer/autumn 2020 IBTSurveys.

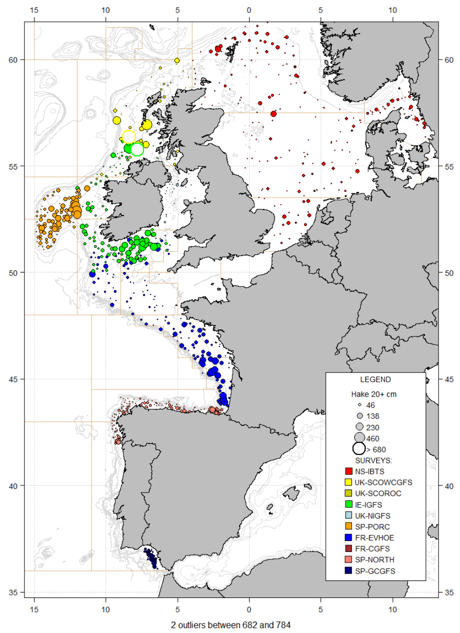


Figure A.6.9. Catches in numbers per hour of 1+ group European hake, *Merluccius merluccius* (≥20cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

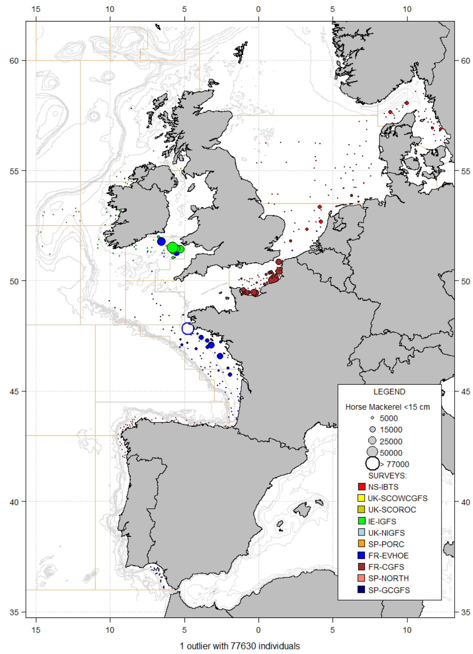


Figure A.6.10. Catches in numbers per hour of 0-group horse mackerel, T*rachurus trachurus* (<15 cm), in summer/autumn 2020 IBTSurveys.

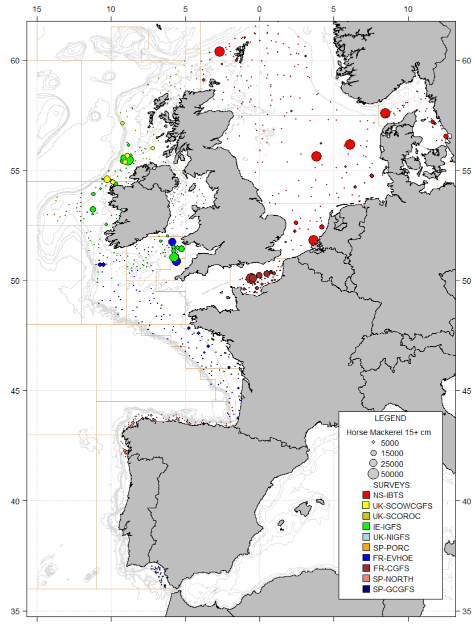
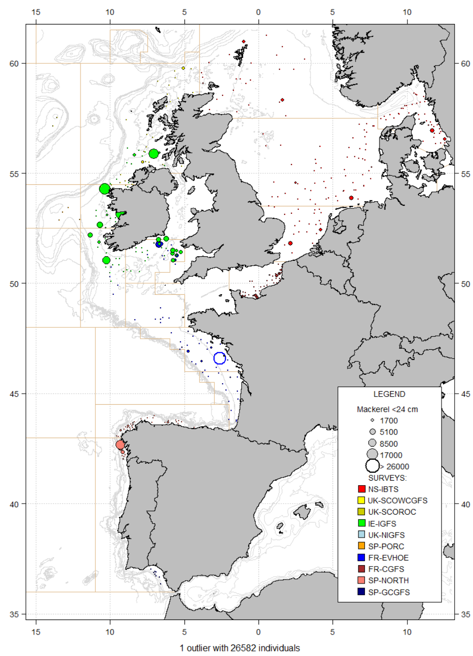


Figure A.6.11. Catches in numbers per hour of 1+ group horse mackerel, *Trachurus trachurus* (≥ 15 cm), in summer/autumn 20 IBTSurveys.



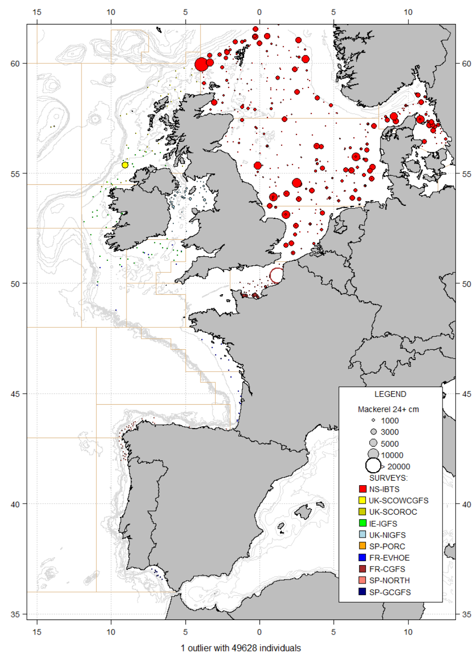
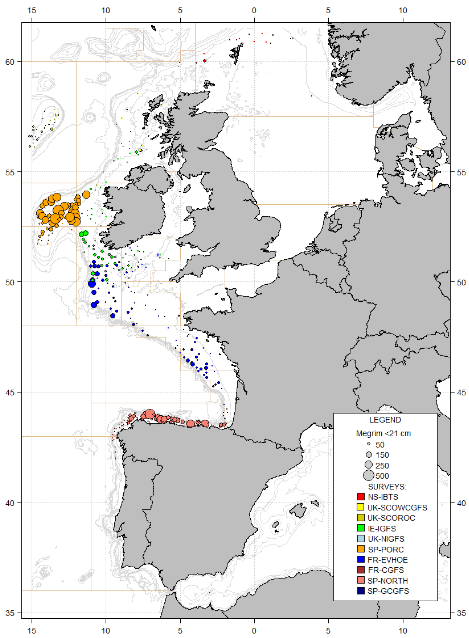


Figure A.6.12. Catches in numbers per hour of 0-group mackerel, *Scomber scombrus* (<24 cm), in summer/autumn 2020 IBTSurveys.

Figure A.6.13. Catches in numbers per hour of 1+ group mackerel, *Scomber scombrus* (≥24 cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey



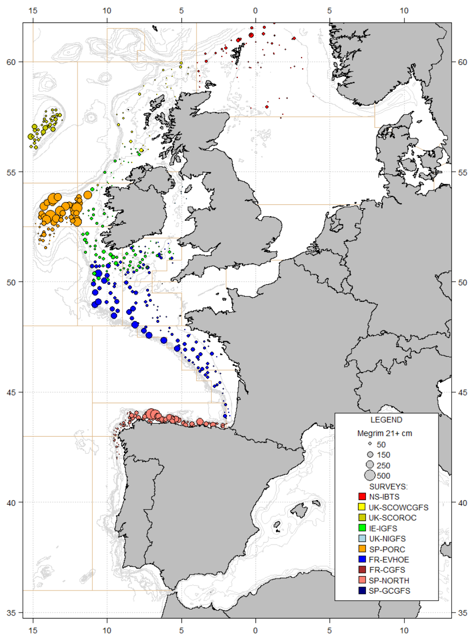


Figure A.6.14. Catches in numbers per hour of megrim recruits, *Lepidorhombus whiffiagonis* (<21 cm), in summer/autumn 2020 IBTSurveys.

Figure A.6.15. Catches in numbers per hour of 2+ group megrim, *Lepidorhombus whiffiagonis* (≥21cm), in summer/autumn 2020 IBTSurveys.

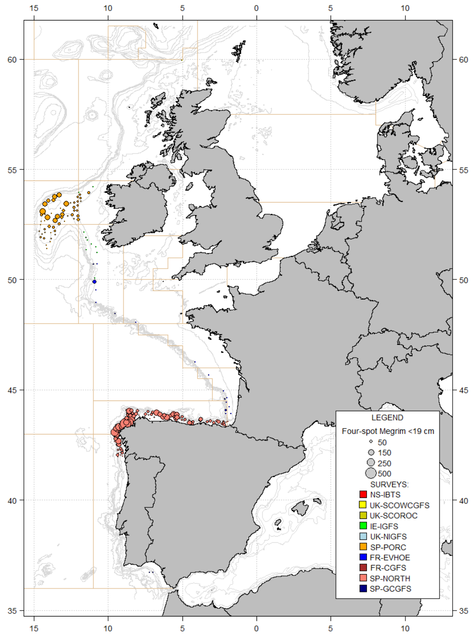


Figure A.6.16. Catches in numbers per hour of recruits of four-spotted megrim, *Lepidorhombus boscii* (<19 cm), in summer/autumn 2020 IBTSurveys.

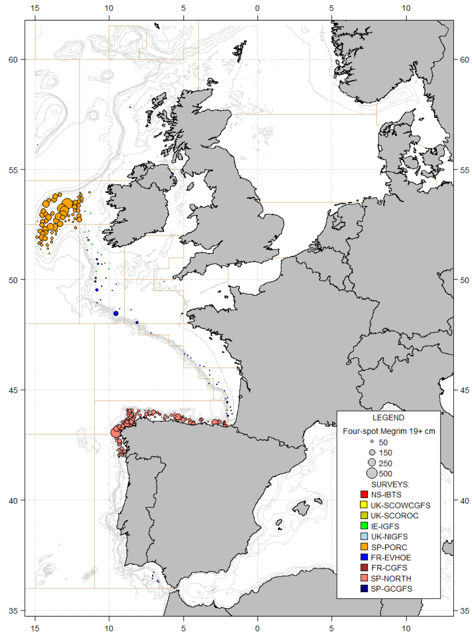


Figure A.6.17. Catches in numbers per hour of 2+ group four-spotted megrim, *Lepidorhombus boscii* (≥19 cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

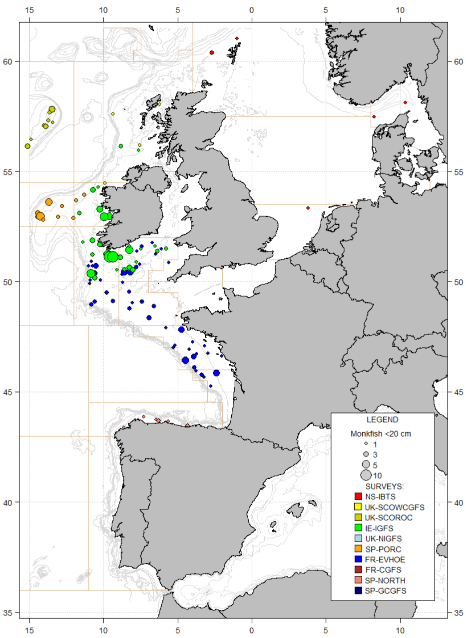


Figure A.6.18. Catches in numbers per hour of 0-group monkfish, *Lophius piscatorius* (<20 cm), in summer/autumn 2020 IBTSurveys.

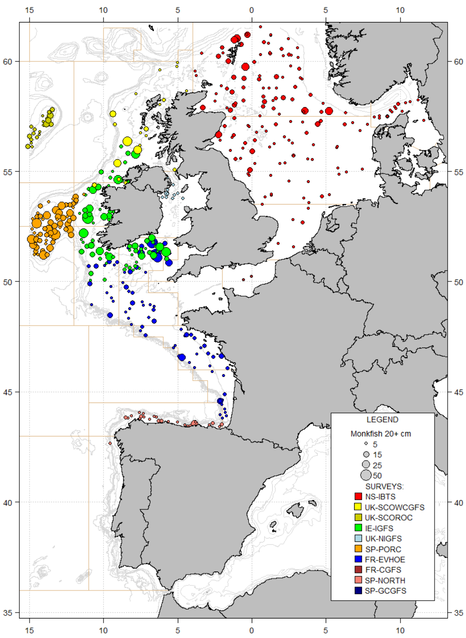


Figure A.6.19. Catches in numbers per hour of 1+ group monkfish, *Lophius piscatorius* (≥20 cm), in summer/autumn 2020 IBTSurveys.

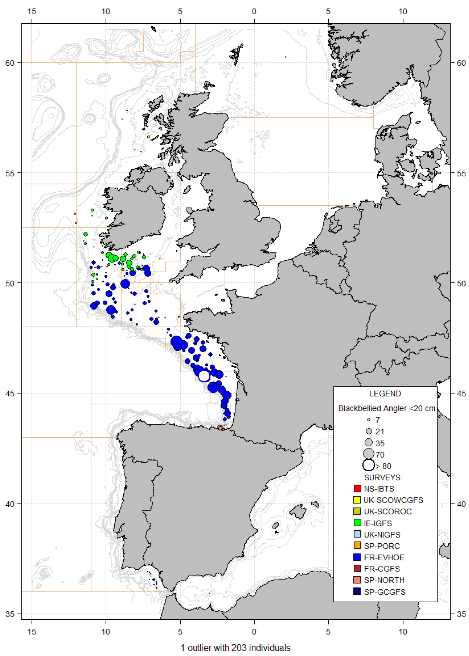


Figure A.6.20. Catches in numbers per hour of 0-group black-bellied anglerfish,

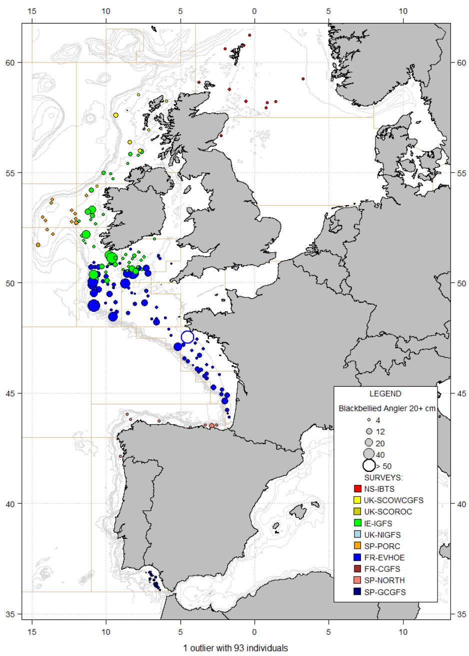


Figure A.6.21. Catches in numbers per hour of 1+ group black-bellied anglerfish, *Lophius budegassa* (<20 cm), in summer/autumn 2020 IBTSurveys.

Lophius budegassa (≥20 cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

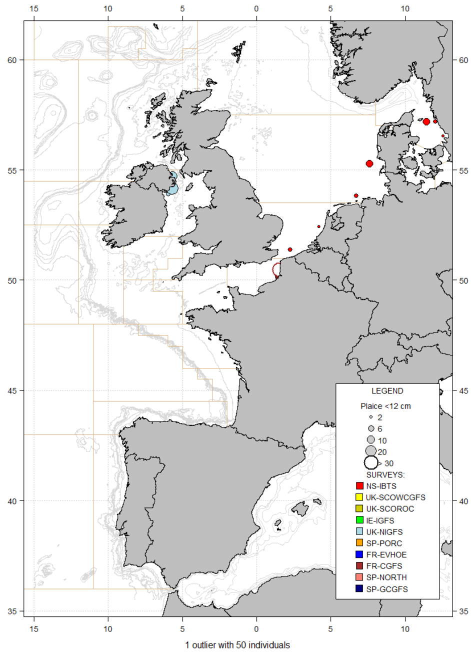


Figure A.6.22. Catches in numbers per hour of 0-group plaice, *Pleuronectes platessa* (<12 cm), in summer/autumn 2020 IBTSurveys.

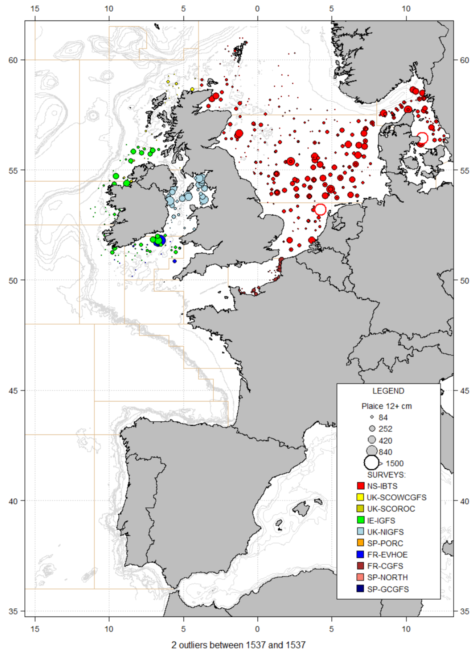


Figure A.6.23. Catches in numbers per hour of 1+ group plaice, *Pleuronectes platessa* (≥12 cm), in summer/autumn 2020 IBTSurveys.

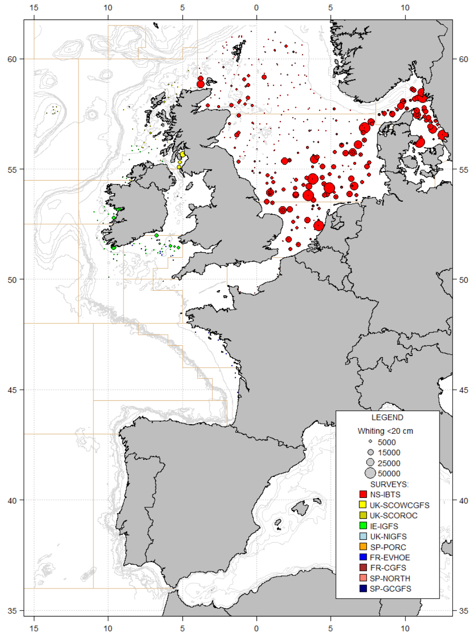


Figure A.6.24. Catches in numbers per hour of 0-group whiting, *Merlangius merlangus* (<20 cm), in summer/autumn 2020 IBTSurveys.

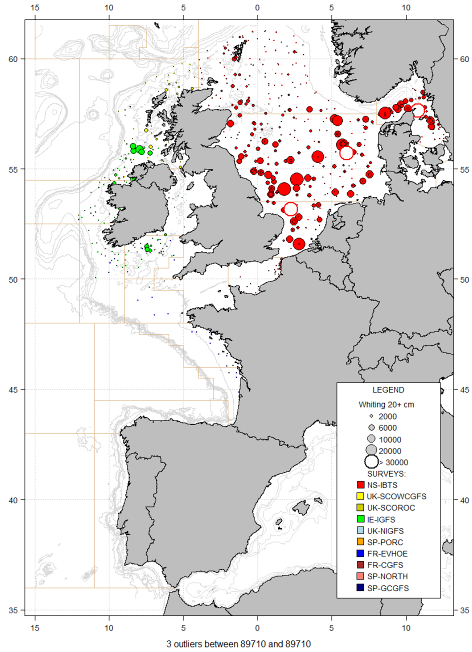
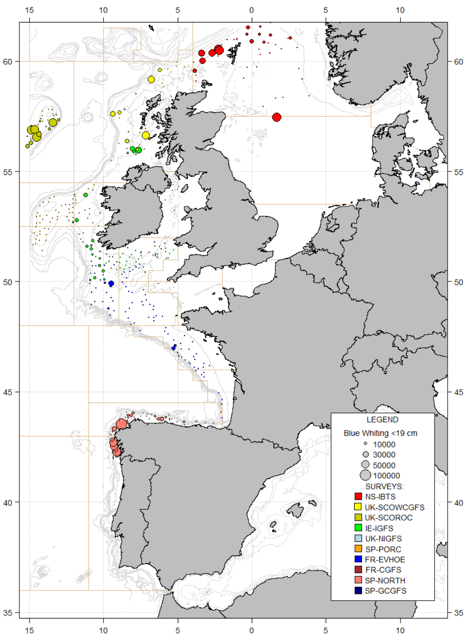


Figure A.6.25. Catches in numbers per hour of 1+ group whiting, *Merlangius merlangus* (≥20 cm), in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey



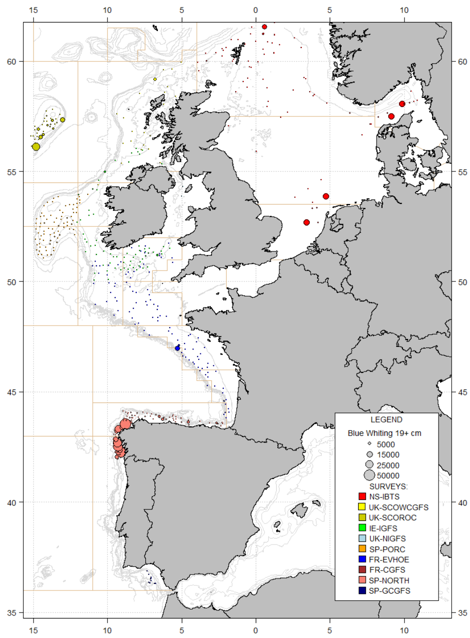
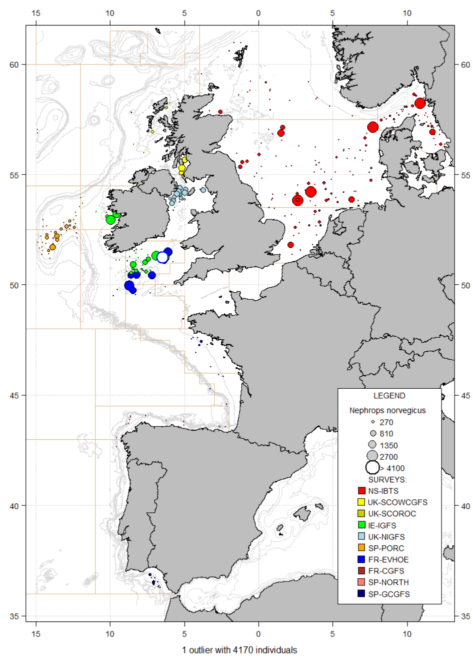


Figure A.6.26. Catches in numbers per hour of 0-group blue whiting, *Micromesistius poutassou* (<19 cm), in summer/autumn 2020 IBTSurveys.

Figure A.6.27. Catches in numbers per hour of 1+ group blue whiting, *Micromesistius poutassou* (≥19 cm), in summer/autumn 2020 IBTSurveys.



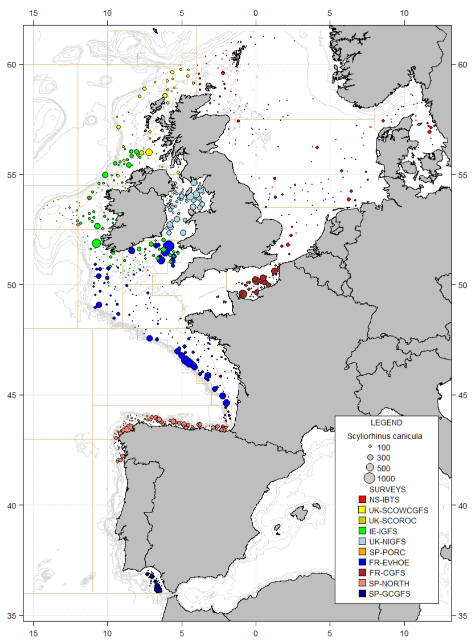


Figure A.6.28. Catches in numbers per hour of Norway lobster, *Nephrops* *norvegicus*, in summer/autumn 2020 IBTSurveys.

Figure A.6.29. Catches in numbers per hour of lesser spotted dogfish, *Scyliorhinus canicula*, in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

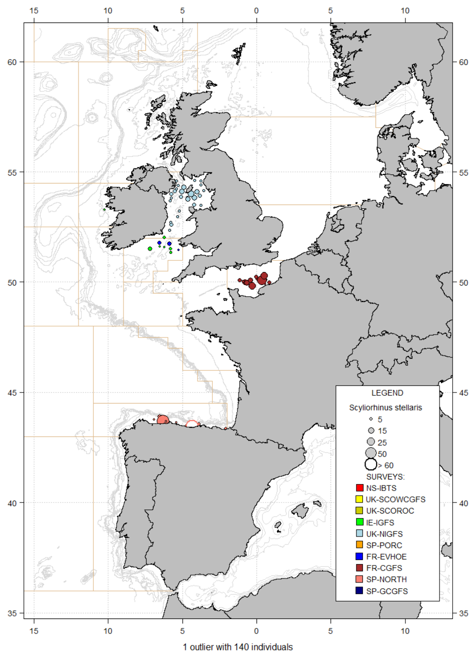


Figure A.6.30. Catches in numbers per hour of nurse hound, *Scyliorhinus stellaris*, in summer/autumn 2020 IBTSurveys.

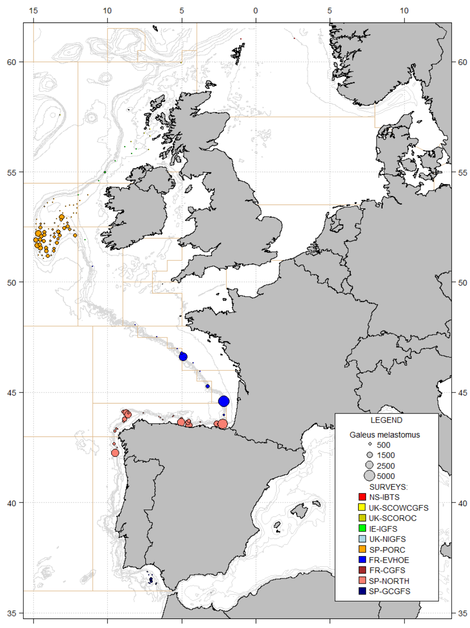


Figure A.6.31. Catches in numbers per hour of Blackmouthed dogfish, *Galeus melastomus*, in summer/autumn 2020 IBTSurveys.

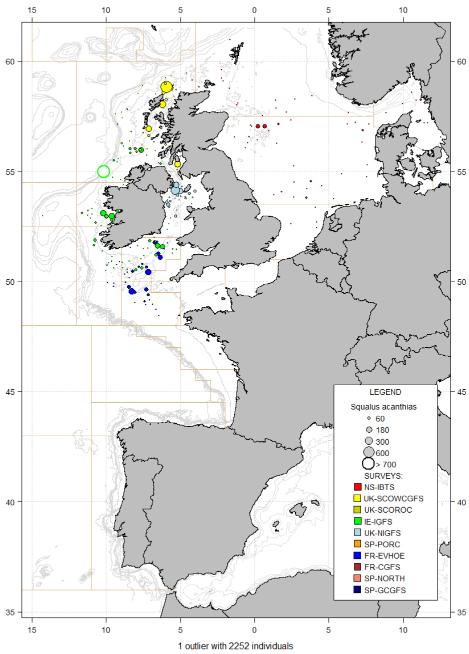


Figure A.6.32. Catches in numbers per hour of spurdog, *Squalus acanthias*, in summer/autumn 2020 IBTSurveys.

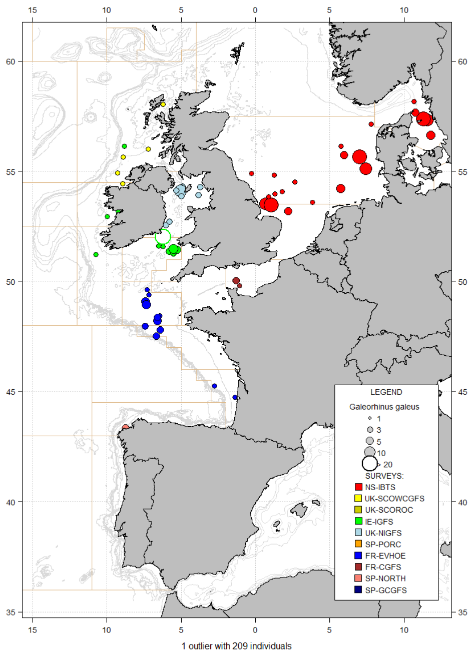
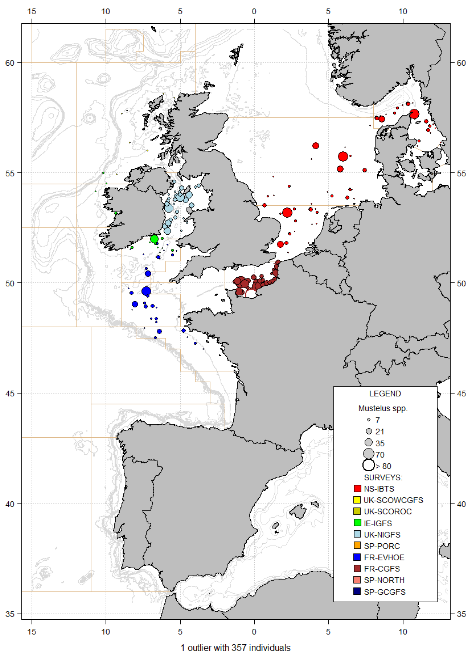


Figure A.6.33. Catches in numbers per hour of tope, *Galeorhinus galeus*, in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey



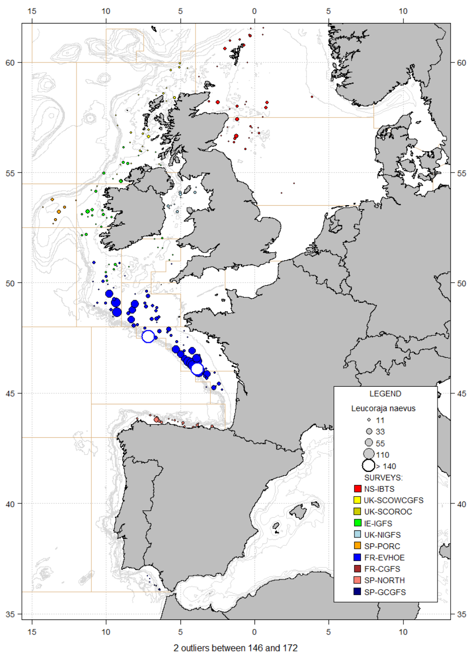


Figure A.6.34. Catches in numbers per hour of smooth-hound, *Mustelus* spp. in summer/autumn 2020 IBTSurveys.

Figure A.6.35. Catches in numbers per hour ofcuckoo ray, *Leucoraja naevus*, in summer/autumn 2020 IBTSurveys.

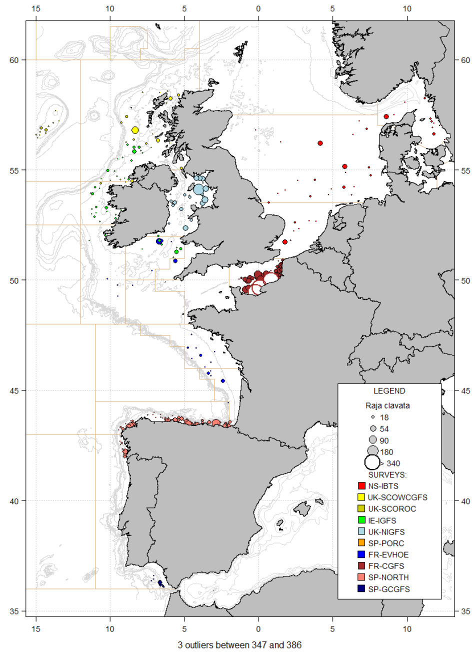


Figure A.6.36. Catches in numbers per hour per hour of thornback ray, *Raja clavata*, in summer/autumn 2018 IBTSurveys.

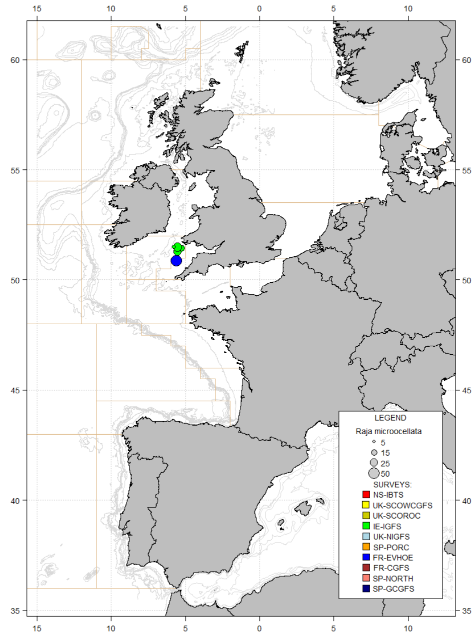


Figure A.6.37. Catches in numbers per hour per hour of small eyed ray, *Raja microocellata*, in summer/autumn 2018 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

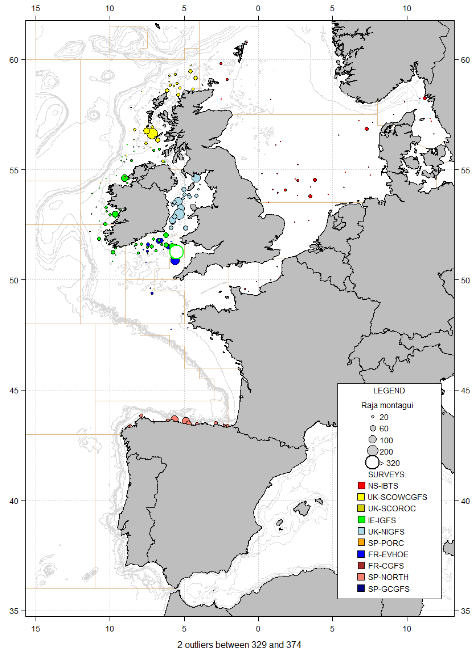


Figure A.6.38. Catches in numbers per hour per hour of spotted ray, *Raja montagui*, in summer/autumn 2020 IBTSurveys.

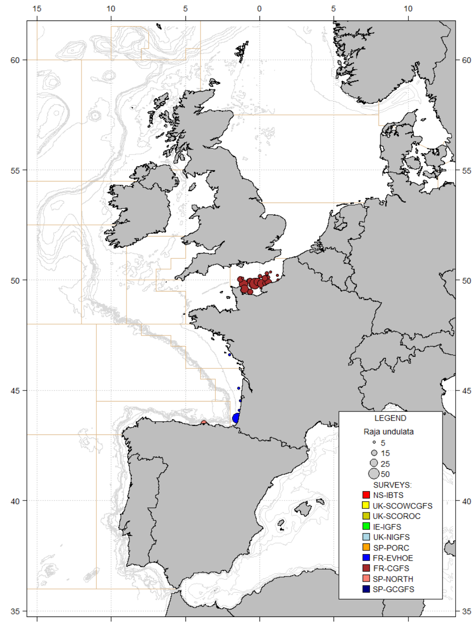


Figure A.6.39. Catches in numbers per hour per hour of undulate ray, *Raja undulata*, in summer/autumn 2020 IBTSurveys.

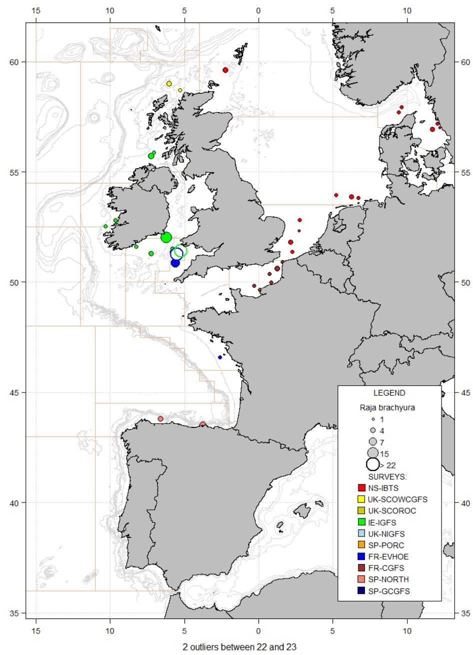


Figure A.6.40. Catches in numbers per hour per hour of Broadnose skate, *Raja brachyura*, in summer/autumn 2020 IBTSurveys.

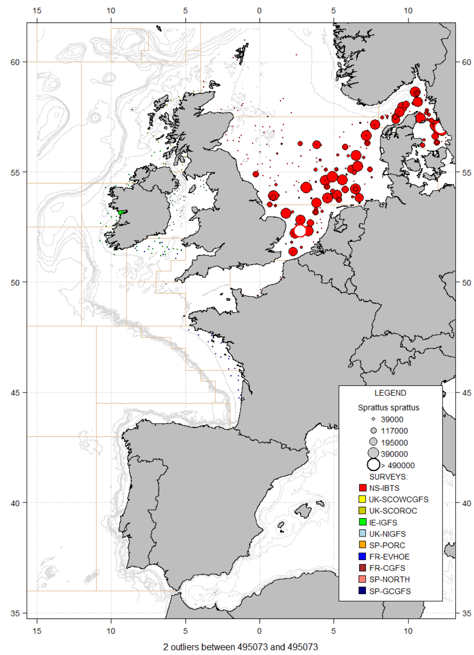


Figure A.6.41. Catches in numbers per hour per hour of European sprat, *Sprattus sprattus*, in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

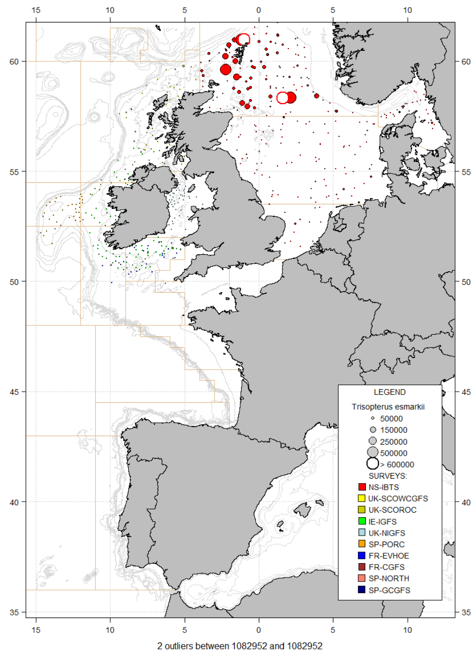


Figure A.6.42. Catches in numbers per hour per hour of Norway pout, *Trisopterus esmarkii*, in summer/autumn 2020 IBTSurveys.

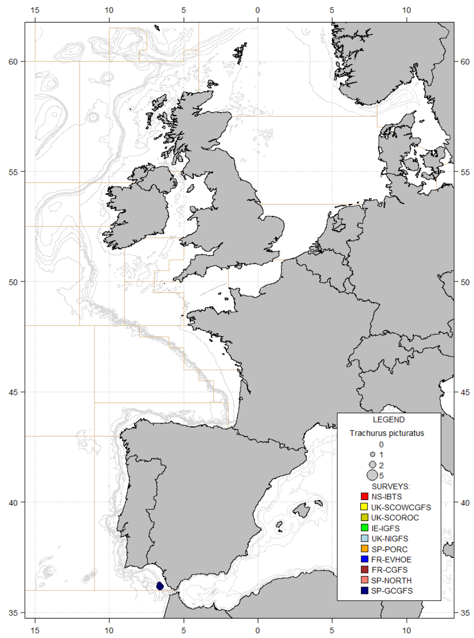
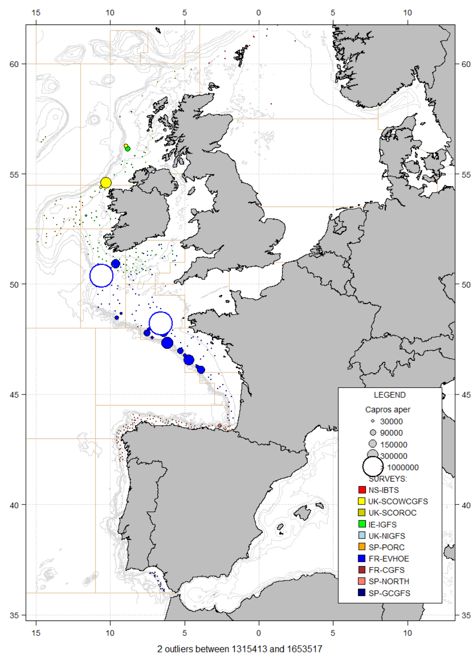


Figure A.6.43. Catches in numbers per hour per hour of blue jack mackerel, *Trachurus picturatus*, in summer/autumn 2020 IBTSurveys.



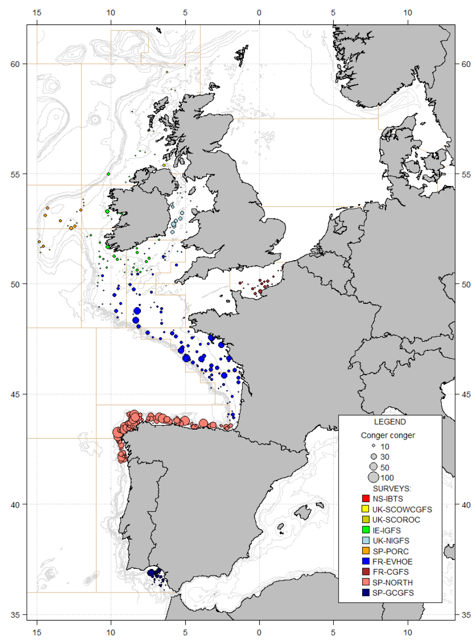


Figure A.6.44. Catches in numbers per hour per hour of Boarfish, *Capros aper*, in summer/autumn 2020 IBTSurveys.

Figure A.6.45. Catches in numbers per hour per hour of Conger, *Conger conger*, in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey

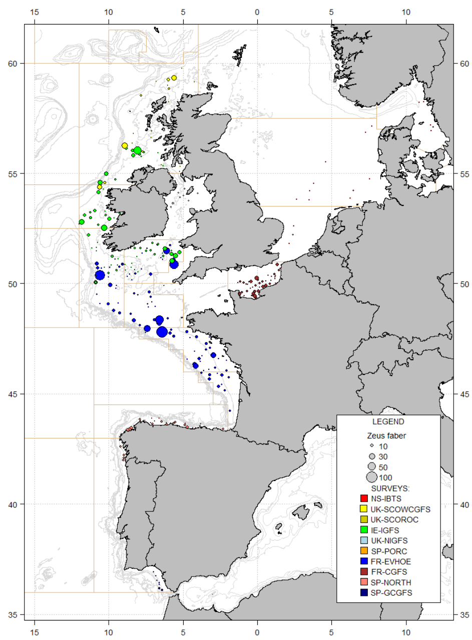


Figure A.6.46. Catches in numbers per hour per hour of John Dory, *Zeus faber*, in summer/autumn 2020 IBTSurveys.

The catchability of the different gears used in the NeAtl surveys is not constant; therefore the following maps do not reflect proportional abundance in all the areas but within each survey.

Annex 7: Recommendation on permit issue

Recommendation that the ICES Secretariat notify the national delegates regarding recent problems relating to permissions to undertake survey work in the waters of other countries.

Various difficulties have arisen, or increased, in recent years regarding the authorization for trawl surveys coordinated through ICES IBTSWG to be undertaken in the waters of another country. These difficulties have arisen from two different aspects:

1. Delays in the permit reception date, whereby a submitted application is delayed at subsequent stages, so that the six-month consultation period required is compromised. The national laboratory submitting the application is not informed of progress in their application, and this has then resulted in queries regarding permissions to be undertaken at short notice.

2. A request for justification of no impact, or to avoid, recently designated MPAs, with this also associated with delays due to further consultations.

   For some surveys, this has now resulted in the loss of a significant portion of the sampling plan (*e.g.* CGFS in 2020) or the displacement of certain historically sampled stations. These issues, therefore, affect the ability of standardised ICES-coordinated surveys to operate as planned and compromise valuable time-series data.

   IBTSWG recommend that the ICES Secretariat bring these issues to the attention of the National Delegates, and that the National Delegates be asked to raise these issues with their national administrations. Furthermore, these issues could potentially be resolved by:

1. Improving the communication chain for foreign permissions, so that the laboratory submitting an application through their national administration is notified that the application has successfully been received by the other national administration.
2. Providing a multi-year exemption for scientific surveys to trawl in foreign waters, including certain spatially-managed areas (e.g. MPAs). Whilst specific areas where trawl exclusions are in place to protect fragile habitats can be avoided in survey plans, many other MPAs have been designated for other features, including features for which the impact from scientific trawl surveys would be minimal, if at all. Consequently, a more coordinated, holistic and streamlined approach for considering the survey areas of multi-annual, scientific trawl surveys could be developed. Such an approach would reduce the need for each annual application to be subject to consultations each year and, therefore, be both cost-effective and efficient for the timing of applications.

Annex 8: Recommendation on chub mackerel (Scomber colias) abundance index

Recommendation WKCOLIAS recommends that the IBTSWG performs an in-depth analysis of these surveys to evaluate their use as an index of abundance for chub mackerel stock assessment.

1. **WKCOLIAS: The IBTS surveys that cover the European area of chub mackerel distribution have the advantage of a long time series and wide spatial coverage. In some of the areas, such as Portuguese waters, the IBTS is the only survey with a long enough time series for assessment.**

A complete revision of the data on catches and samplings of chub mackerel in the DATRAS data base has been performed (table A8.1). One of the problems detected was related to the changes in the taxonomy of the species, in the Atlantic ocean, from *Scomber japonicus* to *Scomber colias.* The historical records in DATRAS have not been updated, and records of *Scomber japonicus* are still present in DATRAS for some surveys as shown in table below. Another problem lies with sampling vessels and gears used which differ between countries, with no combined index approved. The only way to look for a suitable and purposeful index for now will be to analyse each survey and look for similar tendencies.

WKCOLIAS should ask WKISDAA for guidance on how to combine indices from the different surveys/gears.

Table A8.1– Chub mackerel (*S. japonicus* and *S. colias*) catch in IBTS surveys as total number per survey and year.

IE-IGFS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. japonicus	-	-	1	-	-	1	-	-	-	-	-
EVHOE	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. japonicus	-	1985	8867	887	-	-	-	-	-	-	-
S. colias	-	-	-	-	2391	1472	5881	170	2331	276	260
SP-NORTH	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. japonicus	8	54	36	30	86	481	276	2805	1246	18	166
PTIBTS	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. colias	2941	7787		3985	1149	1515	5353	79085	19384		
SP-ARSA Q1	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. japonicus	73	47	31	899	290	323	429	74	248	535	32
SP-ARSA Q4	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S. japonicus	58289	268	600	141	168	72	29338	7982	116321	241	5462

EVHOE (Figure A8.1): three years with marked peaks of abundance of chub mackerel, 2012, 2014 and 2016, juveniles: 14-17 cm in 2012, 11-14cm in 2014 and somewhat larger (17-19 cm) in 2016, very scarce since 2016 and larger individuals entrance in 2018 (25-27cm).

SP-North (Figure A8.2): signals of small recruits in 2015 and 2016, peak of larger individuals in 2017 and 2018, slight signal of juveniles (16-18 cm in 2020).

PT-IBTS (Figure A8.3): strong signals of juveniles (18-20 cm) in 2011, 2013 and highest in 2017 that could be the evolution of the smaller signal of recruits (14-16 cm) in 2016.

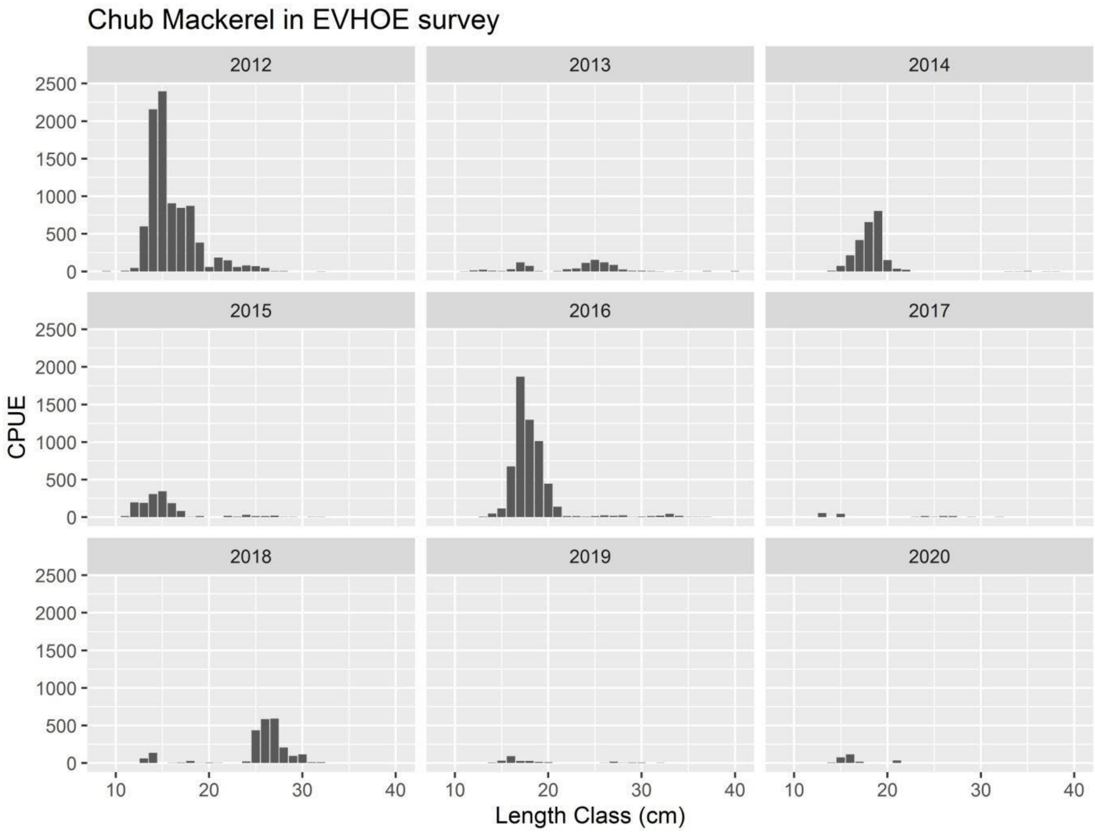


Figure A8.1 Stratified length distribution of chub mackerel in EVHOE surveys between 2012 and 2020.

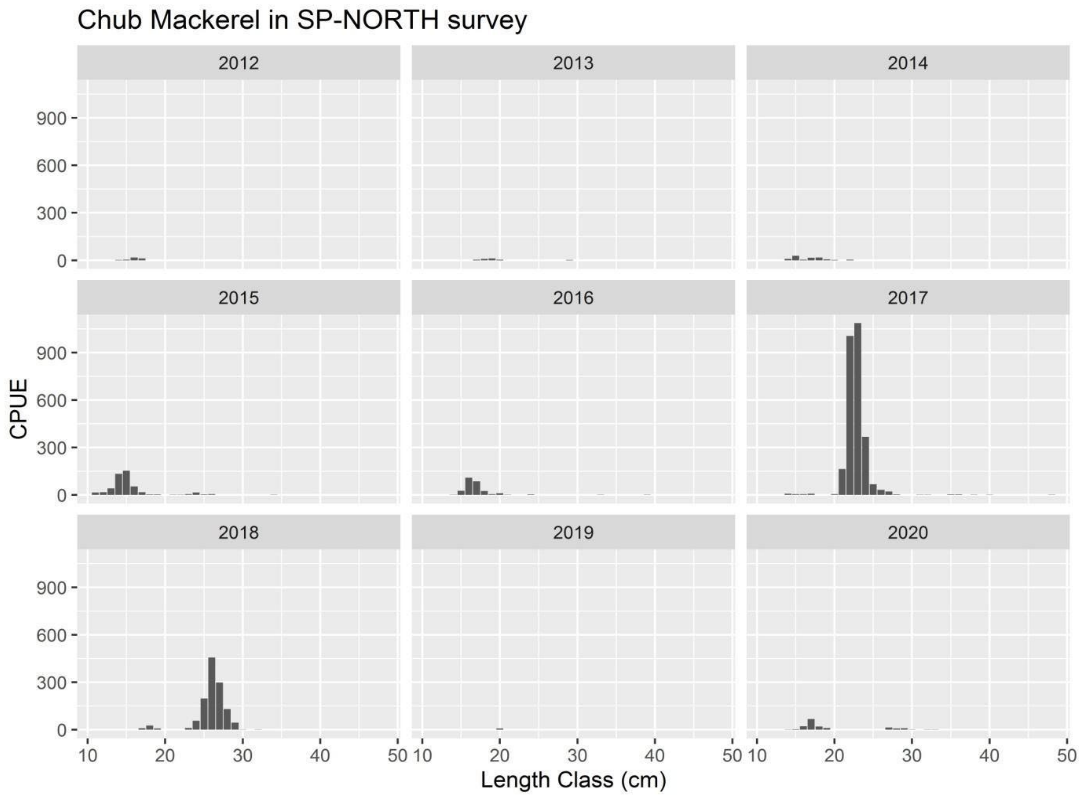


Figure A8.2.- Stratified length distribution of chub mackerel in SP-NORTH surveys between 2012 and 2020.

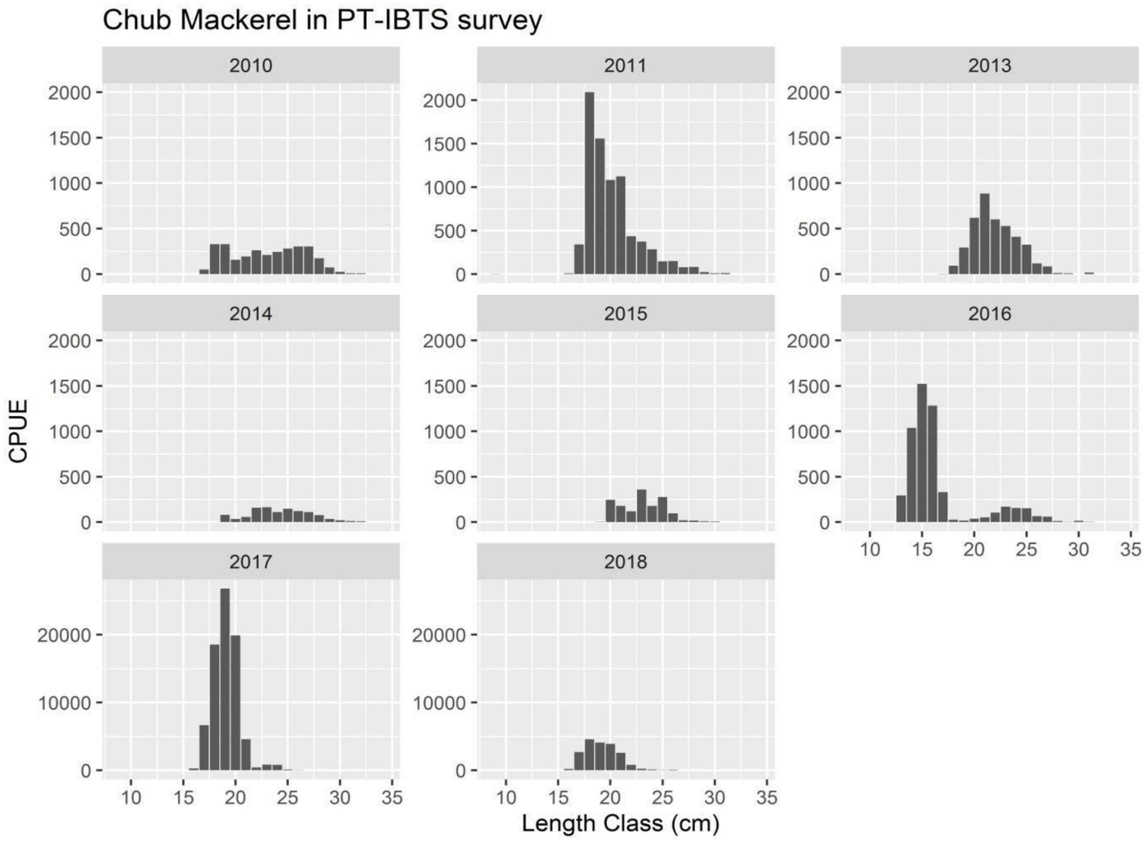


Figure A8.3 Stratified length distribution of chub mackerel in PT-IBTS surveys between 2010 and 2018. No surveys have been performed in the last years due vessel unavailability, 2021 is expected to be performed with a new vessel.

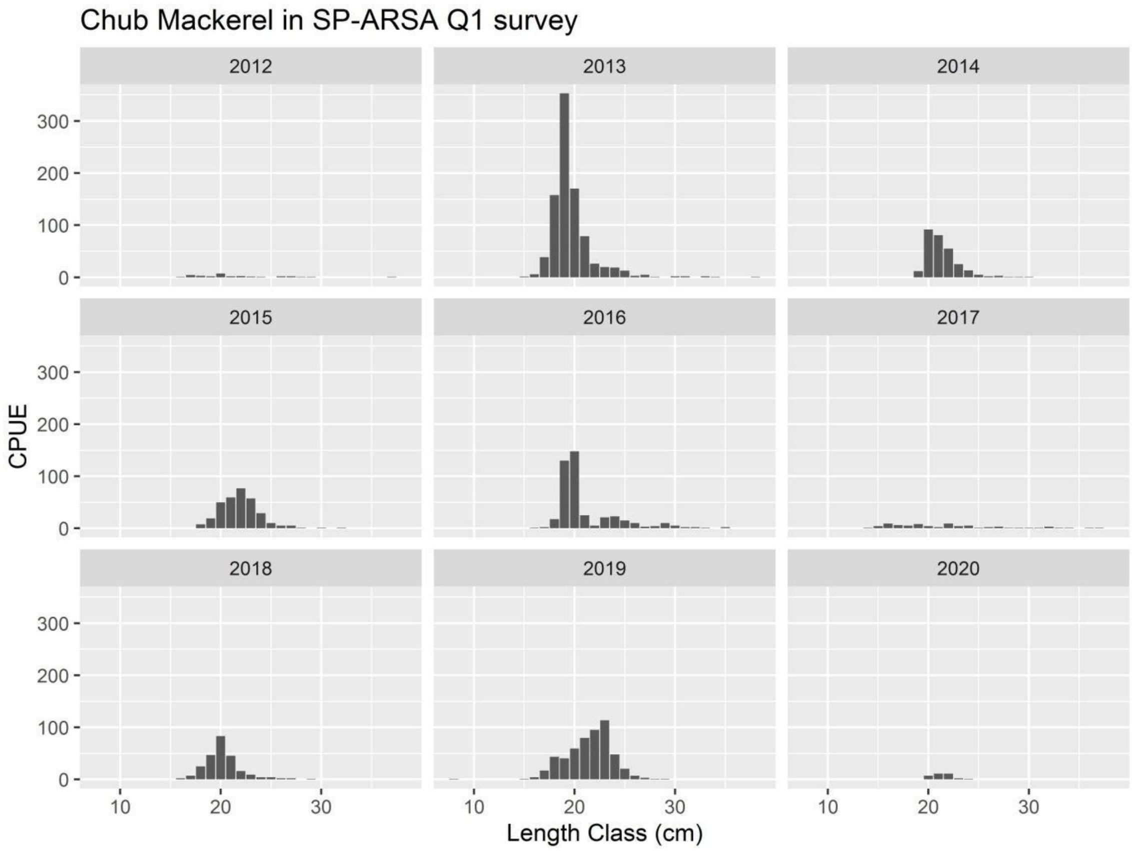


Figure A8.4. Stratified length distribution of chub mackerel in SP-ARSA 1st quarter surveys between 2012 and 2020.

SP-ARSA (Figure A8.4) : strong signals of juveniles (18-21 cm) several years between 2013 and 2019 on the first quarter survey. In the fourth quarter the strong abundance starts in 2016 and 2017 between 13 to 19cm, but in 2018 the remarkable abundance of sizes 18-19cm overshadows the rest of the signals.

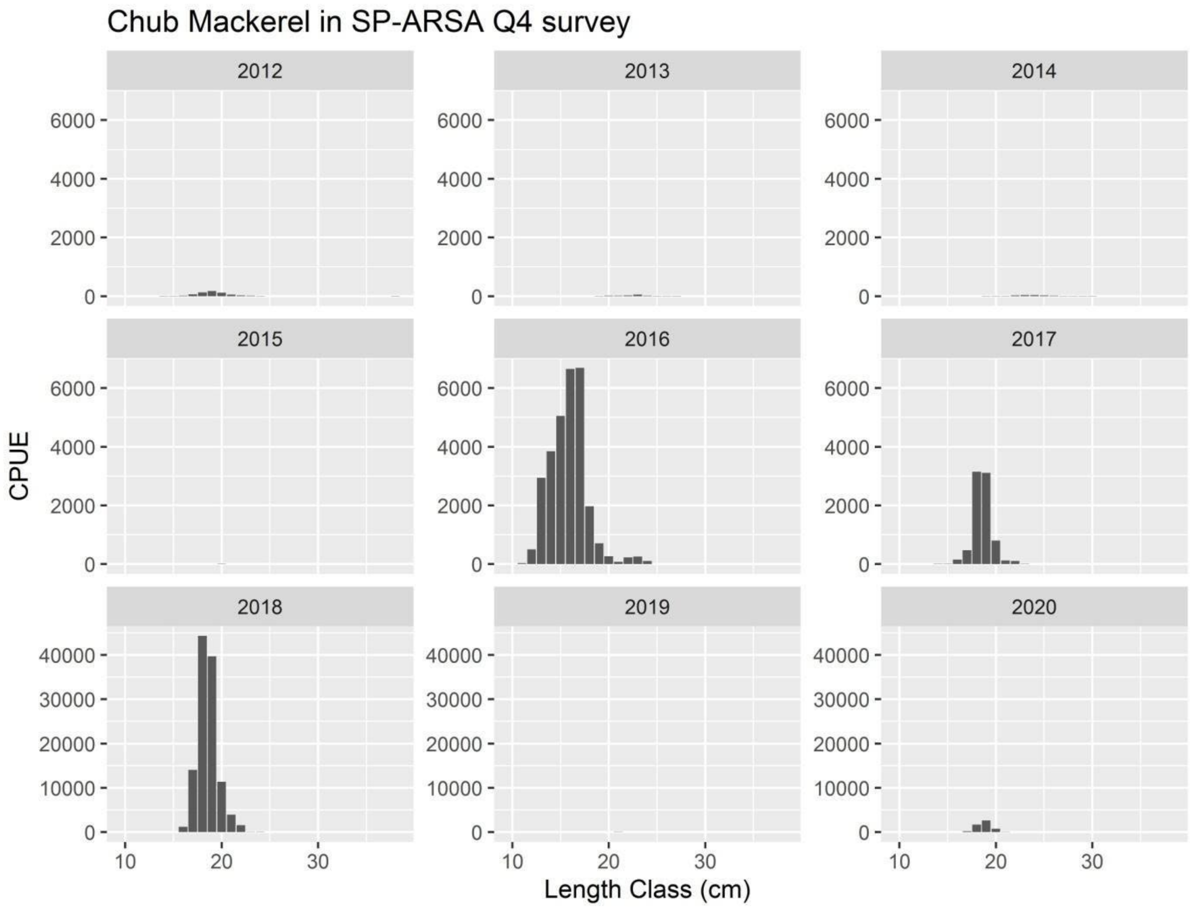


Figure A 8.5. Stratified length distribution of chub mackerel in SP-ARSA 4th quarter surveys between 2012 and 2020.

Signal from PT-IBTS is not followed in next year by SP-ARSA Q1, but high recruitment value were recorded by PT-IBTS and SP-ARSA Q4 in 2016, 2017 and 2018 (Figure A8.5). As it is believed that as recruitment tends to grow, distribution spreads northwards, signals of high recruitment shows in SP-NORTH in 2017 and 2018 and also for EVHOE in 2016 and 2018.